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ALL VOLUMES

R645-301-100 Through R645-301-800

INTRODUCTION

The Alton coal field is located in T39S, R6W and T39S, R5W SLB&M, Kane County, Utah. Kane County is located in the southwest quarter of Utah. The town of Kanab, which is the Kane County Seat, is located about 30 miles south of the Alton coal field (see attached vicinity and location drawings).

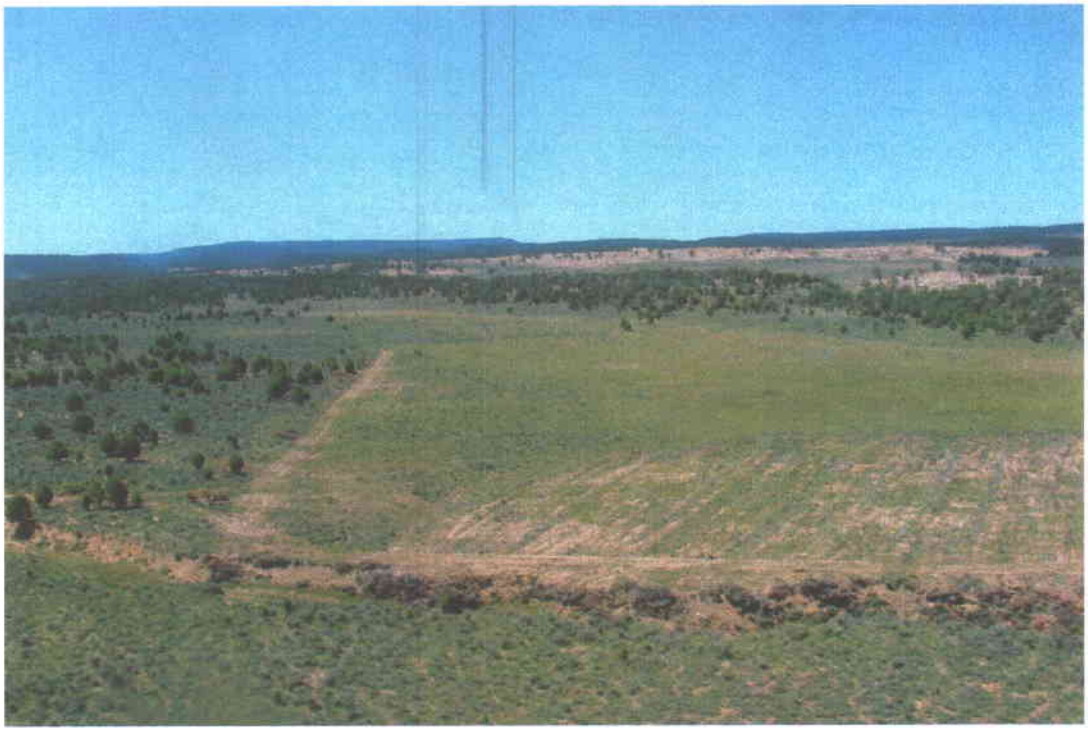
Alton Coal Development, LLC (ACD) is proposing the development of a portion of the Alton coal field. The proposed development is the Coal Hollow Mining Project. The center of the Coal Hollow Project (CHP) is located approximately 3 miles south of the town of Alton, Utah.

ACD has initiated the processes involved to secure coal leases and a permit to mine coal from the project area. In 2004, ACD negotiated surface and coal leases for the private or fee areas of the Alton coal field. In 2004 ACD submitted a Lease by Application (LBA) to the Department of the Interior, Bureau of Land Management State Office, Salt Lake City, Utah for federal coal acreage contiguous to the secured private lease area. In 2006, ACD submitted a Mining and Reclamation Plan (MRP) to the Utah Division of Oil, Gas and Mining (UDOGM). This MRP submittal was determined to be administratively incomplete in August 2006. ACD addressed the deficiencies list provided by the Division and resubmitted the MRP in June of 2007.

The Coal Hollow Project involves a surface mining operation that will produce approximately 2,000,000 tons of coal annually. The coal will be transported from the Alton coal field in trucks to Cedar City where it will be loaded into railcars and hauled to market.

In early 2004, ACD initiated base line studies within the area of the Alton coal field. Base line studies are required by state and federal agencies prior to submitting a MRP application.

In 2004, ACD hand picked consultants and personnel to prepare field and base line studies for the Coal Hollow Project. Consultants were selected based on their technical expertise and higher personal and professional ethical standards. The CHP will be a flagship coal mining operation and its culture of excellence will not start when the first ton of coal is mined, but rather from project inception. ACD seeks to develop a culture of high integrity extending to it personnel, mining operations, community relations, and environmental performance.



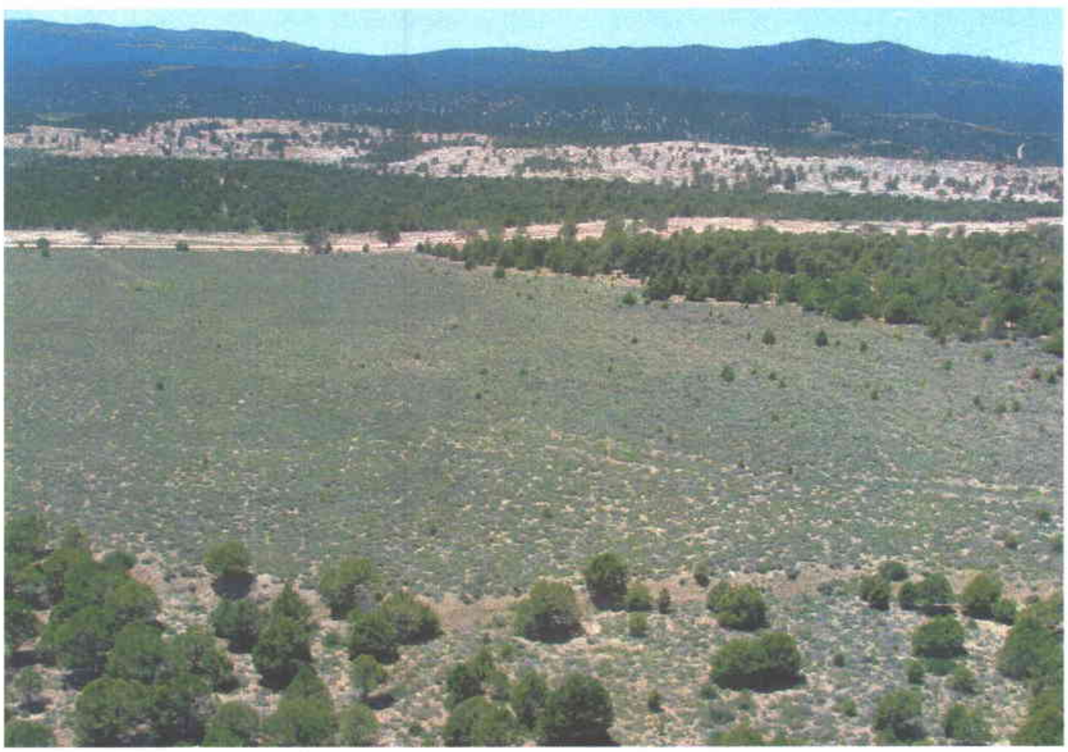
Startup area of the surface mine - phase 1 mining area
View to the south

View of coal seam exposed in Robinson Creek
Phase 1 area of Mining
View to the NE

Phase 1 mining area (lest)
Coal loadout (background)
Phase 2 mining area (foreground) – view to the north

Phase 3 & 4 mining area
View to the west

View of the proposed coal loadout area
The town of Alton (background) – view to the NE



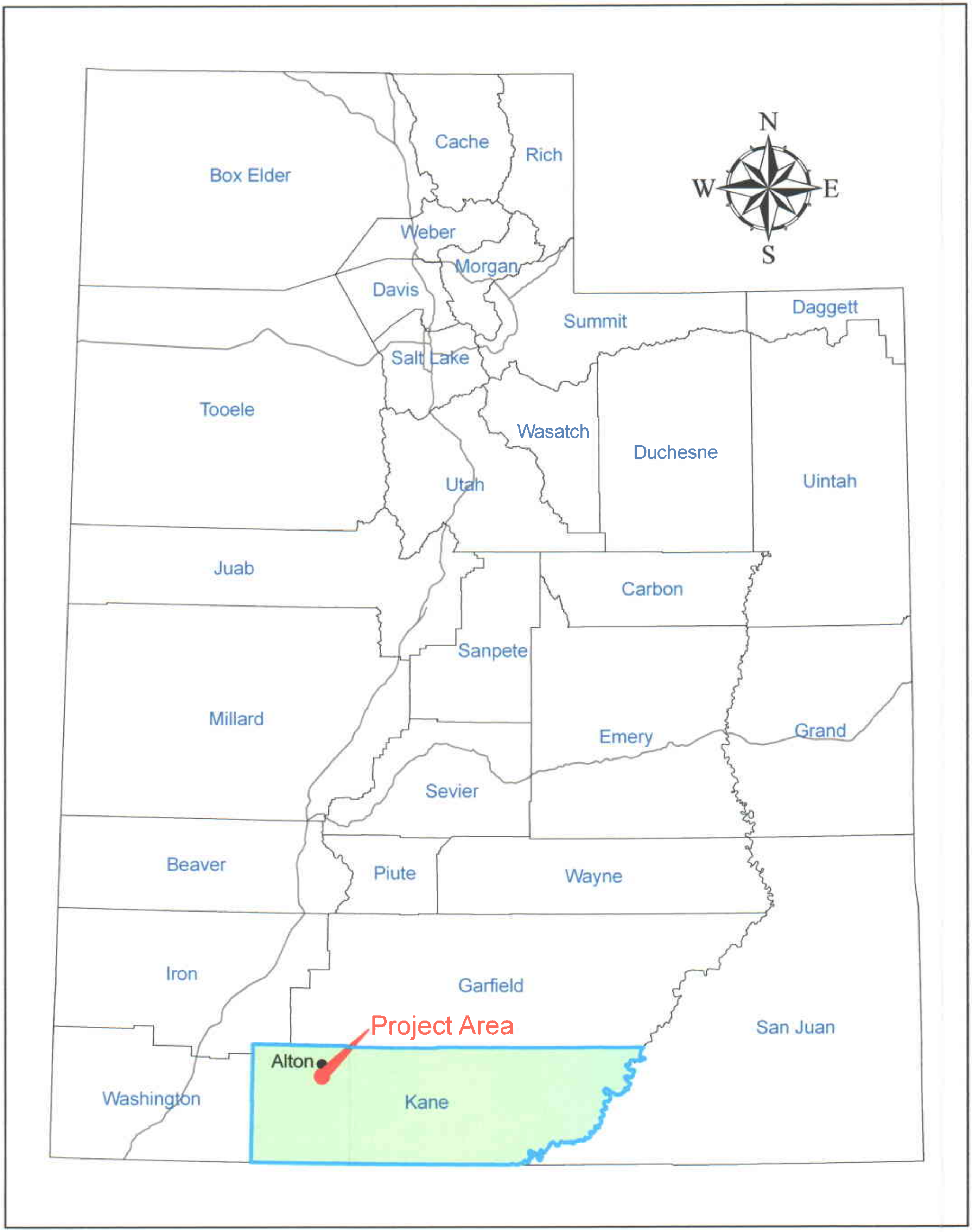
View of proposed coal loadout
View to the NE

View of area to be mined and reclaimed – view to the south

- BLM Pinion-Juniper 2005 treatment area (foreground)
    - The Pinion-Juniper community has out competed with the other vegetative species, creating barren ground
    - The reclamation process will improve the natural ground and vegetation communities by planting more suited vegetative plant species more suitable to the area (grazing and wildlife)
- County Road # 136 running north/south through proposed permit area
- County road will be relocated to bypass mining operations
- Bypass route will start at the bottom right edge of photo
    - Bypass route will be relocated west of existing county road
    - Bypass route will reconnect with existing county road (top of photo) approximately 3 miles of bypass road
- Mining operations will be cordoned off to civilian traffic
- After coal is removed and the area reclaimed, the surface contour will be reduced by 0.7’

View of area to be mined and reclaimed – view to the north

Location of 1960's reclaimed Alton Coal mine
Portal was in cleared area of hillside



General Location

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R645-301-100

Legal, Financial, Compliance and Related Information

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CHAPTER 1

R645-301-100. GENERAL CONTENTS

110 LEGAL, FINANCIAL, COMPLIANCE, and RELATED INFORMATION

110 INTRODUCTION

Alton Coal Development, LLC is submitting a Mining and Reclamation Plan for the Coal Hollow Project to the Utah Division of Oil, Gas and Mining pursuant to rules governing coal mine permitting at R645-301-100 et seq. Permit Area Base Drawing – Drawing 1-1.

112 IDENTIFICATION OF INTERESTS

112.100 Business Entity

Applicant, Alton Coal, LLC, is a limited liability company duly organized and validly existing under the laws of the State of Nevada, and authorized to conduct business under the laws of the State of Utah.

112.200 Permit Applicant and Permittee:

Alton Coal Development, LLC
PO Box 1230
Huntington, UT 84528
Telephone (435)-687-5310)
Employer I. D. #42-1655092
Social Security numbers of Alton Coal Development, LLC's members and manager provided in "CONFIDENTIAL BINDER"

112.210 Operator:

Alton Coal Development, LLC
PO Box 1230
Huntington, UT 84528
Telephone (435)-687-5310)
Employer I. D. #42-1655092

112.220 Resident Agent:

Corporation Trust Company of Nevada
6100 Neil Road
STE 500
Reno, NV 89511

For Utah:

Allen P Childs
PO Box 1230
Huntington, Utah 84528
435-687-5310

112.230 Abandoned Mine and Reclamation Fee

Alton Coal Development, LLC, is the sole party in interest and will pay the abandoned mine land reclamation fee.

112.300 Ownership and Control

Alton Coal Development, LLC, is the sole party in interest, owning and controlling this application.

112.310 Members and Managers of Alton Coal Development, LLC

Social Security numbers of Alton Coal Development, LLC's members and manager provided in "CONFIDENTIAL BINDER" Appendix 1-1

Manager -	ALLEN P. CHILDS 570 North Main St. Orangeville, UT 84537
Member	STONIE BARKER 714 Bob White Lane Naples, FL 34108
Member	BEVERLY HOLWERDA 960 Cape Marco Drive Marco Island, FL 34145
Member	ROBERT C. NEAD 6602 Ilex Circle Naples, FL 34109
Member	JAMES J. WAYLAND 2841 Capistrano Way Naples, FL 34105

All members and managers use the employer identification number of Alton Coal Development, LLC No. 42-1655092

112.320 Relationship to the Applicant

Each of the above-listed managers and members owns and controls more than 10% of Alton Coal Development, LLC

112.330 Title and Date of Position

Each of the managers and members listed at 112.310 above was appointed as of September 9, 2004.

112.340. Ownership or control of Other Coal Mining and Reclamation Operations

Neither Alton Coal Development, LLC nor its manager or members owns and has not in the previous five years owned another coal mining and reclamation operation.

112.350 Application Number – Other Pending Coal Mining and Reclamation Operations

Neither Alton Coal Development, LLC nor its manager or members owns any pending coal mine permits.

112.400 Coal Mining and Reclamation Operations Owned or Controlled

Neither Alton Coal Development, LLC nor its manager or members owns or controls any other coal mining and reclamation operations.

112.410 Coal Mining and Reclamation Operations Owned or Controlled by Managers or Members of Alton Coal Development, LLC

Neither Alton Coal Development, LLC nor its manager or members owns or control any other coal mining and reclamation operations.

112.420 Ownership and Control Relationship of Managers and Members of Alton Coal Development, LLC

Each of the managers and members listed at § 112.320 own or control more than 10% of Alton Coal Development, LLC

112.500 Legal or Equitable Owner of the Surface and Mineral Properties

The legal and equitable owners of the surface and mineral properties to be affected by this mining operation during the duration of the permit period are shown below. Surface and coal ownership are shown on Drawings 1- 3 and 1-4.

SURFACE OWNERSHIP:

Owner/Lessor:	*Lessee:*
C. Burton Pugh 533 N 650 E Lindon, Utah 84042-1567 801-785-6220	Alton Coal Development, LLC

COAL OWNERSHIP:

Owner/Lessor:	*Lessee:*
C. Burton Pugh 533 N 650 E Lindon, Utah 84042-1567 801-785-6220	Alton Coal Development, LLC
Roger M. Pugh, Attorney in Fact & Power of Attorney for Verna H. Pugh	
116 South 100 West Kanab, UT 84741	
Margaret Moyers Kanab, Utah	

SURFACE OWNERSHIP:

Owner/Lessor:	*Lessee:*
Alecia Swapp Dame Trust Through Richard, Trustee 1620 Georgia Ave. Boulder City, NV 89 702-293-4773	Alton Coal Development, LLC

COAL OWNERSHIP:

Owner/Lessor:	*Lessee:*
Alecia Swapp Dame Trust Through Richard, Trustee 1620 Georgia Ave. Boulder City, NV 89 702-293-4773	Alton Coal Development, LLC

112.600 Owners of Record of Property Contiguous to Proposed Permit Area

Owners of surface properties contiguous to the proposed permit area are shown on Drawing 1-3 and the name and address of each such owner is as follows:

Department of the Interior, Bureau of Land Management
District and Regional Office
Salt Lake City, Utah

Darlynn and Arlene Sorensen
Orderville, Utah
435-648-2462

112.700 MSHA Numbers

Applications for MSHA identification numbers for the Coal Hollow Mine are pending.

112.800 Interest in Contiguous Lands

The applicant has interest in lands contiguous to the permit area. A Lease by Application (LBA) is currently being processed by the United States Department of the Interior, Bureau of Land Management, Salt Lake City, Utah.

Alton Coal Development, LLC, the sole party in interest, submitted the LBA application in September, 2004. The LBA is contiguous to the permit area and contains approximately 2,746 acres. See Drawing 1-2 for LBA delineation.

112.900 Certification of Submitted Information

After Alton Coal Development, LLC is notified that the application is approved, but before the permit is issued, Alton Coal will update, correct or indicate that no change has occurred in the information submitted under R645-301-112.100 through .800.

113 VIOLATION INFORMATION

Neither the applicant, affiliates, members or managers or persons controlled by or under common control with the applicant has: (i) had a federal or state mining permit suspended or revoked in the last five years; (ii) nor forfeited a mining bond or similar security deposited in lieu of a bond; (iii) nor received a violation during the last three year period.

114 RIGHT OF ENTRY INFORMATION

Applicant bases its right to enter and begin coal mining activities in the permit area and the consent of the surface owner to extract coal by surface mining methods upon the following documents:

Lessor:	*Lessee:*
C. Burton Pugh	Alton Coal Development, LLC

Surface and Mineral Lease, dated 9/10/04.

Lessor:	*Lessee:*
Alecia Swapp Dame Trust	Alton Coal Development, LLC

Surface and Mineral Lease, dated 4/29/05.

Copies of the lease assignments are included in Appendix 1-2.

115 STATUS OF UNSUITABILITY CLAIMS

The permit area is not within an area or under study as an area designated as unsuitable for mining under R645-103-400, nor has any petitions been filed with the UDOGM under R645-103-420 that could affect the proposed permit area. The Coal Hollow Project is located on private lands adjacent to federal lands, which after careful consideration were declared suitable for mining in 1980 by then Secretary of Interior Andrus. Secretary's Decision, Petition to Designate Certain Federal Lands In Southern Utah Unsuitable for Surface Coal Mining, OSM Ref No. 79-5-001, dated December 16, 1980, copy attached at Appendix 1-3.

This petition was filed under the provisions of section 522(c) of the federal Surface Mining Control and Reclamation Act ("SMCRA"). OSM Notice, Receipt of a Complete Petition for Designation of Lands as Unsuitable for Surface Coal Mining Operations, 45 fed. Reg. 3398, Jan. 17, 1980, attached at Appendix 1-3.

Those federal lands in the Petition area found suitable for mining include lands adjacent to the private lands which the Project has included in a federal lease by application and located in Kane County, Utah within Township 39 South, Ranges 5 and 6 West, SLM. Secretarial Decision at Paragraph 4. The Secretarial Decision was based on an extensive Administrative Record, including the Petition filed under Section 533 of SMCRA, 30 U.S.C. Section 1272, public hearings, a combined petition evaluation document and environmental impact statement published in two volumes on November 26, 1980 as, "Southern Utah Petition Evaluation Document" and the "Southern Utah Petition Evaluation Document - Comments and Responses." The Secretarial Decision was further supported by a 52 page Statement of Reasons, dated January 13, 1981, attached at Appendix 1-3.

The Secretarial Decision was upheld by the federal court in *Utah International, Inc. v. Watt*, 553 F. Supp. 872 (D. Utah 1982).

116 PERMIT TERM

116.100 There are 3 mining phases associated with this permit term. The first phase of mining is anticipated to start July 1, 2008. Each mining phase has a 1 year term. Phase 3 is anticipated to conclude in year 2011.

Acres of disturbance per Mining Phase

Phase 1	286 acres
Phase 2	109 acres
Phase 3	38 acres

116.200 Permit Term

The Coal Hollow Mine Project is proposed for a 5-year term under the Permanent Regulatory Program for 5 years

117 INSURANCE, PROOF OF PUBLICATION

Proof of publication pursuant to R645-303-322 will be included in Appendix 1-5.

117.100 Certificate of Liability Insurance

A copy of the Certificate of Insurance is found in Appendix 1-4.

118 PERMIT FILING FEE

A copy of this permit is on file with the Utah Division of Oil, Gas and Mining (UDOGM), P.O. Box 145801, Salt lake City, Utah 84114-5801. A filing fee of $5.00 accompanied permit submittal.

120 PERMIT APPLICATION FORMAT AND CONTENTS

This permit application contains information and will comply with R645-301-120. A notarized statement attesting to the accuracy of this information is set forth at Appendix 1-6.

130 REPORTING OF TECHNICAL DATA

All technical data submitted in the permit application will be accompanied by the name or organization responsible for the collection and analysis of data, dates of collection and descriptions of methodology used. Technical analyses will be planned by or under the direction of a qualified professional in the subject to be analyzed.

The following assisted or were consulted in the preparation of this permit application:

State of Utah, Department of Natural Resources
Division of Oil, Gas and Mining
Salt Lake City, Utah

Department of the Interior, Bureau of Land Management
District and Regional Office
Kanab and Salt Lake City, Utah

United States Geological Survey, Utah Region
Salt Lake City, Utah

United States Department of Agriculture
Soil Conservation Service
Salt Lake City, Utah

State of Utah, Department of Natural Resources
Division of Wildlife Resources (DWR)
Salt Lake City, Price and Cedar City, Utah

Dr. Patrick D. Collins
Mt. Nebo Scientific Research & Consulting
Springville, UT

Erik Petersen
Petersen Hydrologic, LLC
Lehi, UT

John T. Boyd Company
James Boyd
Mining & Geological Consulting
Canonsburg, PA

John T. Boyd Company
Rich Bate
Mining & Geological Consulting
Denver, CO

Dr. James E. Nelson
Brigham Young University
Provo, UT

Talon Resources, Inc
Huntington, UT

C. Burton Pugh
Lindon, UT

Richard Dame
Boulder City, NV

University of Miami
Miami, FL

Keith Montgomery
Montgomery Archaeological
Moab, UT

Dr. Stephen Petersen
Philomath, OR

Larry Hayden-Wing
Hayden-Wing Associates, LLC
Laramie, WY

Mark Page
Water Rights Consultant
Price, UT

D.A. Smith Drilling
Loma, CO

Kane County
76 North Main
Kanab, UT

Heaton Livestock
PO Box 100773
Alton, UT

Geochron Laboratories
Cambridge, MA

Energy Labs
Billings, MT

Taylor Geo-Engineering
Alan O. Taylor
Lehi, UT

Long Resource Consultants
Robert E. Long
Morgan, UT

JBR Environmental, Inc.
Dawn Whaley
Sandy, UT

Bruce Chesler
Escalante, UT

A.H. Hamblin
Paleontogical Consulting
Cedar City, UT

140 DRAWING AND PLANS

The Drawing and plans in the Mining and Reclamation Plan are submitted consistent with the requirement of R645-301-140.

150 COMPLETENESS

Alton Coal Development, LLC represents that the information contained in the Coal Hollow Mining and Reclamation Plan permit application to be complete and correct.

APPENDIX 1-3

Exhibit 1 Petition to Designate Certain Federal Lands

Exhibit 2 Lands as Unsuitable for Surface Coal Mining Operations

Exhibit 3 The Secretarial Decision

Exhibit 1

Petition to Designate Certain Federal Lands

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PETITION TO DESIGNATE CERTAIN FEDERAL)
LANDS IN SOUTHERN UTAH UNSUITABLE FOR)
SURFACE COAL MINING)

OSM REFERENCE
No: 79-5-001

2005 JUN 18 ... 4710

SECRETARY'S DECISION

Under section 522 of the Surface Mining Control and Reclamation Act of 1977, I have been petitioned by the Sierra Club, Environmental Defense Fund, Friends of the Earth and others to declare certain lands adjacent to Bryce Canyon National Park in Southern Utah unsuitable for all types of surface coal mining operations. Other individuals also intervened in support of the petition. Utah International Inc. and Nevada Electric Investment Co., who hold Federal coal leases in the petition area, were granted leave to intervene in opposition to the petition.

As required by sections 522 (c) and (d) of the Surface Mining Act, public comment on the petition was sought, public hearings were held in Utah and a detailed statement was prepared to evaluate the petition and the alternative actions available to me in reaching a decision on the petition. In reaching my decision on the Southern Utah petition, I have considered the information contained in the final combined petition evaluation and environmental impact statement, as well as the information provided by the petitioners, intervenors, Federal agencies, the State of Utah, local agencies, industry and members of the public in the form of testimony at the public hearings and all written comments received up to the close of the comment period on October 20, 1980.

Based upon all of that information, which is in the administrative record of this proceeding, I have reached the following decision:

1. I hereby designate as unsuitable for surface coal mining operations, including surface impacts incident to underground mining which would be visible from Bryce Canyon National Park, all Federal lands in townships T.40S, R. 4W; T. 39S, R. 4W; T. 38S, R. 4W; T. 38S, R. 3W; T. 37S, R. 4W; T. 37S, R. 3W; and T. 36S, R. 3W; of the Salt Lake Meridian; and T. 36S, R. 2W, of the Salt Lake Meridian is designated unsuitable only for mining by surface methods;

2. I base this designation on the criteria of Section 522(a)(3)(B) of the Surface Mining Act which provides that an area may be designated unsuitable for all or certain types of surface coal mining operations if such operations will "affect fragile or historic lands in which such operations could result in significant damage to important historic, cultural, scientific, and esthetic values and natural systems";

3. My statement of reasons, to be issued shortly, will explain the basis for my conclusions that mining in the designated areas would cause significant cumulative impacts on Bryce Canyon National Park by reducing visibility, by creating dust plumes and large disturbed areas which would be visible for long periods of time from the park, and by generating mechanical activity and blasting that would be audible from the park, thereby adversely affecting the values for which the park was established and, thus, the experience of the park's visitors;

4. I decline to designate, and hereby reject the petition as it relates to, remaining areas of Federal lands other than those described above in paragraph 1;

5. Upon review of any specific mining plan and permit application for surface mining of the other Federal leases in the Alton coal field that are not covered by this designation, or underground mining in the designated areas, the Department, through the National Park Service and the Office of Surface Mining, will consider whether potential impacts on the visual resources and noise levels in the park from mining on these leases need to be mitigated by means of special stipulations or conditions;

6. Under no circumstances should this decision become the only basis for protection of the values for which Bryce Canyon National Park was established and I direct that these park values be taken into account in future decisions by the bureaus of this Department on mining plans, permit applications or other activities on undesignated Federal lands near the park;

7. Appropriate bureaus of the Department are hereby directed to take all necessary actions under section 522(b) of the Surface Mining Act or other authority to implement this decision for the areas listed in paragraph 1 above; and

8. The lessee-intervenors' claims of substantial legal and financial commitments in the leased area, under section 522 (a)(6) of the Surface Mining Act, are being processed separately according to the procedures of the Office of Surface Mining, and a decision on those claims will be issued subsequently by that office.

Copies of this decision should be sent simultaneously by certified mail to all parties in this proceeding. This decision will become final upon the date of issuing my statement of reasons. Any appeal from this decision must be filed within 60 days from that date in the United States District Court for Utah, as provided in section 526(a)(1) of the Surface Mining Act.

December 16, 1980 — Date

Cecil D. Andrus

Cecil D. Andrus

Exhibit 2

Lands as Unsuitable for Surface Coal Mining

Operations

Office of Surface Mining Reclamation and Enforcement

Extension of Public Comment Period on the Texas Amended Program Submission for the Regulation and Control of Surface Coal Mining

AGENCY: Office of Surface Mining Reclamation and Enforcement (OSM), United States Department of the Interior.

ACTION: Extension of public comment period on the Texas amended program submission of the regulation and control of surface coal mining.

SUMMARY: OSM is extending the period for review and comment on the proposed regulatory program until January 21, 1980. This action further amends procedures announced on December 21, 1979 (44 FR 75733), which extended the public comment period until December 28, 1979. The extended period provides additional opportunity for the public to review and comment on amendments to the proposed regulatory program submitted by Texas and on summaries of meetings and communications between OSM and Texas on these amendments.

DATES: All comments must be received on or before 5:00 p.m. on January 21, 1980, to be considered in the Secretary's decision on the proposed Texas regulatory program.

ADDRESS: The proposed Texas regulatory program, as amended, is available for review during business hours at:

The Office of Surface Mining Reclamation and Enforcement, Scarritt Building, 818 Grand Avenue, Kansas City, Missouri 64106, Telephone (816) 374-3920.
Railroad Commission of Texas, Capitol Station, P.O. Box Drawer 12967, Austin, Texas 78711.
OSM Headquarters, Department of the Interior, Room No. 135, 1951 Constitution Avenue NW., Washington, D.C. 20240, Telephone (202) 343-4728.

Written comments should be delivered by 5:00 p.m. on January 21, 1980 to:

The Office of Surface Mining Reclamation and Enforcement, Region IV, Scarritt Building, 818 Grand Avenue, Kansas City, Missouri 64106.
OSM Headquarters, Department of the Interior, Room No. 135, 1951 Constitution Avenue NW., Washington, D.C. 20240, Telephone (202) 343-4728.

SUPPLEMENTARY INFORMATION: This extended period of of public comment is to allow opportunity for any interested persons to review and comment on a December 31, 1979, letter from the Director of the Texas Surface Mining and Reclamation Division to the Regional Director. The letter concerns those portions of the Texas program dealing with intervention in administrative proceedings, *ex parte* contact during administrative proceedings, and discovery in administrative proceedings. This announcement is made in keeping with OSM's commitment to public participation, as a vital component in fulfilling the purposes of the Surface Mining Control and Reclamation Act of 1977.

Dated: January 11, 1980.

Carl C. Close,

Acting Director.

[FR Doc. 80-1412 Filed 1-16-80; 8:45 am]

BILLING CODE 4310-05-M

Receipt of a Complete Petition for Designation of Lands as Unsuitable for Surface Coal Mining Operations

AGENCY: Office of Surface Mining Reclamation and Enforcement.

ACTION: Notice of Receipt of a Complete Petition for Designation of Lands as Unsuitable for Surface Coal Mining Operations.

SUMMARY: Pursuant to § 769.16 of Title 30, Code of Federal Regulations, notice is given that the Office of Surface Mining has received a petition to designate certain Federal lands in southern Utah as unsuitable for mining. The petition is described below:

Location of Lands Petitioned for Designation

Petitioners: Environmental Defense Fund, Friends of the Earth, Sierra Club Legal Defense Fund, Sylvan Johnson, Leon Lippincott, Carolyn Lippincott, Jet Mackelprang, Cynthia Myers, Susan Hiltson and Larry Little

State: Utah

Counties: Kane and Garfield

Township, Range, Section: The federal lands within Salt Lake Meridian, Utah

T.40S, R.6W, S.L.M.
T.40S, R.5W, S.L.M.
T.40S, R.4½W, S.L.M.
T.40S, R.4W, S.L.M.
T.39S, R.6W, S.L.M.
T.39S, R.5W, S.L.M.
T.39S, R.4½W, S.L.M.
T.39S, R.4W, S.L.M.
T.38S, R.4W, S.L.M.
T.38S, R.3W, S.L.M.
T.37S, R.4W, S.L.M.
T.37S, R.3W, S.L.M.
T.37S, R.2W, S.L.M.
T.36S, R.3W, S.L.M.
T.36S, R.2W, S.L.M.

Office of Surface Mining Reference Number: 79-5-001.

The petition, filed under Section 522 of the Surface Mining Control and Reclamation Act of 1977, seeks to have specified Federal lands in the area of Bryce Canyon National Park and the Dixie National Forest declared as unsuitable for mining. The petition was submitted to the Office of Surface Mining on November 28, 1979 and was found to be complete on December 27, 1979.

A review of the area's suitability for mining has been undertaken by this office. In addition, the Bureau of Land Management—Utah State Office and the Utah Regional Forester—United States Forest Service as the surface managing agencies for the petitioned area will make recommendations on the petition.

A public hearing is planned for late September 1980, notice of which will be given prior to the hearing. A decision on the petition will be made by November 26, 1980.

This notice is issued at this time for the convenience of the public. The public file on the petition is available for public review during normal working hours at the Division of State and Federal Programs, Office of Surface Mining, Region V, second floor, Brooks Towers, 1020 15th Street, Denver, Colorado and at the Kanab Resource Area Headquarters, Bureau of Land Management, 320 North 1st East, Kanab, Utah.

Copies of the petition are available to the public from the Office of Surface Mining, Region V. Relevant information and comments on the issues raised in the petition are solicited.

FOR FURTHER INFORMATION CONTACT: Barbara J. West, Office of Surface Mining, Region V, Brooks Towers, 1020 15th Street, Denver, Colorado, 80202.

SUPPLEMENTAL INFORMATION: Under Section 522 of the Surface Mining Reclamation and Control Act of 1977 and its implementing regulations, persons with interests which are or may be adversely affected by surface coal mining operations may petition the Office of Surface Mining to have an area designated as unsuitable for all or certain types of surface coal mining operations. In the petition submitted to OSM, the petitioners allege that (1) the lands in question could not be reclaimed in accordance with the requirements of the Act; (2) surface coal mining operations could result in significant damage to important historic, cultural, scientific, and aesthetic values and natural systems of fragile lands; and (3) such operations could result in a substantial loss or reduction of long-range productivity of water supply or of food or fiber products, including damage to aquifers and aquifer recharge areas of renewable resource lands. The proximity of mineable coal lands to Bryce Canyon National Park and the Dixie National Forest and the possible adverse affects of mining on the Park and Forest are of particular concern to the petitioners.

After completion of the analyses and hearing mentioned above, the Department can designate the area or a portion thereof as unsuitable for all or certain types of surface coal mining operations (which includes the surface effects of underground mining). The agency may also find the area as suitable for surface coal mining operations.

Information on which to base analyses of the issues raised by the petitioners is being sought from all interested parties.

Donald A. Crane,

Regional Director.

[FR Doc. 80-1517 Filed 1-16-80; 8:45 am]

BILLING CODE 1517

INTERNATIONAL TRADE COMMISSION

Certain Rotary Scraping Tools; Commission Determination and Order

[Investigation No. 337-TA-62]

In the matter of certain rotary scraping tools.

The U.S. International Trade Commission conducted an investigation under the authority of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), of alleged unfair methods of competition and unfair acts in the unauthorized importation into or sale in the United States of certain rotary scraping tools by reason of (1) the infringement of U.S. Letters Patent No. 3,958,294, and (2) misleading packaging and/or deceptive advertising of the imported rotary scraping tools, including the simulation of complainant's trade dress. On January 9, 1980, the Commission unanimously determined that there was a violation of section 337 and ordered that rotary scraping tools which infringe U.S. Letters Patent No. 3,958,294 be excluded from entry into the United States for the term of that patent (until May 25, 1993), unless the importation is licensed by the patent owner.

The purpose of the Commission determination and order which follow is to provide for the final disposition of the Commission's investigation on certain rotary scraping tools.

Determination

Having reviewed the record compiled in this investigation, the Commission on January 9, 1980, determined—

1. That with respect to eight of the respondents in this investigation,[1] there is a violation of section 337 of the Tariff Act of 1930, as amended, in the importation and sale by the owner, importer, consignee, or agent of either, of rotary scraping tools which infringe U.S. Letters Patent No. 3,958,294, the effect of which is to substantially injure an industry, efficiently and economically operated, in the United States;

2. That the appropriate remedy for such violation is to direct that rotary scraping tools manufactured abroad which infringe U.S. Letters Patent No. 3,958,294 be excluded from entry into the United States for the term of said patent, except where such importation is licensed by the owner of said patent;

3. That, after considering the effect of such exclusion upon the public health and welfare, competitive conditions in the U.S. economy, the production of like or directly competitive articles in the United States, and U.S. consumers, such rotary scraping tools should be excluded from entry for the term of said patent, except where such importation is licensed by the owner of said patent; and

4. That the bond provided for in subsection (g)(3) of section 337 of the Tariff Act of 1930, as amended, be in the amount of 484 percent ad valorem of the imported article (ad valorem to be determined in accordance with sec. 402 of the Tariff Act of 1930, as amended (19 U.S.C. 1401a)).

Order

Accordingly, it is hereby ordered—

1. That rotary scraping tools which infringe U.S. Letters Patent No. 3,958,294 are excluded from entry into the United States for the term of said patent, except where such importation is licensed by the owner of said patent;

2. That rotary scraping tools ordered to be excluded from entry are entitled to entry into the United States under bond in the amount of 484 percent ad valorem (ad valorem to be determined in accordance with sec. 402 of the Tariff Act of 1930, as amended (19 U.S.C. 1401a)) from the day after this order is received by the President pursuant to section 337(g) of the Tariff Act of 1930, as amended; until such time as the President notifies the Commission that he approves or disapproves this action, but, in any event, not later than 60 days after the date of receipt;

3. That this order be published in the Federal Register and that this order and the opinion in support thereof be served upon each party of record in this investigation and upon the U.S. Department of Health, Education, and Welfare, the U.S. Department of Justice, the Federal Trade Commission, and the Secretary of the Treasury; and

4. That the Commission may amend this order at any time.

By order of the Commission.

Issued: January 10, 1980.

Kenneth R. Mason,

Secretary.

[1] These eight respondents are as follows: Celestial Tool Company, Inc.; King Imports, Ltd.; Dao Hang Manufacturing Co.; Eastman Sales Corp.; Boo Ping Industrial Co., Ltd.; V. Lee Industrial Co., Ltd.; Long Lee Industrial Co.; and Chun Her Machinery Co.

[FR Doc. 80-1443 Filed 1-16-80; 8:45 am]

BILLING CODE 7020-02-M

[701-TA-21 (Preliminary)]

Fresh Cut Roses from the Netherlands; Institution of Preliminary Countervailing Duty Investigation and Scheduling of Conference

Investigation instituted. Following receipt of a petition on January 3, 1980, filed on behalf of Roses Incorporated, a trade association of the U.S. rose growing industry, the United States International Trade Commission on January 11, 1980, instituted a preliminary countervailing duty investigation under section 703(a) of the Tariff Act of 1930 to determine whether there is a reasonable indication that an industry in the United States is materially injured, or is threatened with material injury, or the establishment of an industry in the United States is materially retarded, by reason of allegedly subsidized imports from the Netherlands of fresh cut roses, provided for in item 192.18 of the Tariff Schedules of the United States. This investigation will be subject to the provisions of Part 207 of the Commission's *Rules of Practice and Procedure* (19 CFR 207, 44 FR 76457) and, particularly, Subpart B thereof, effective January 1, 1980.

Written Submissions. Any person may submit to the Commission on or before February 5, 1980, a written statement of information pertinent to the subject matter of the investigation. A signed original and nineteen copies of such statements must be submitted.

Any business information which a submitter desires the Commission to treat as confidential shall be submitted separately and each sheet must be clearly marked at the top "Confidential Business Data." Confidential submissions must conform with the

Exhibit 3

The Secretarial Decision

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PETITION TO DESIGNATE CERTAIN FEDERAL LANDS IN SOUTHERN UTAH UNSUITABLE FOR SURFACE COAL MINING OPERATIONS	OSM Reference No: 79-5-001

STATEMENT OF REASONS

I. Introduction

On December 16, 1980, in response to a petition filed by the Sierra Club and others, I issued my written decision declaring unsuitable for surface coal mining operations certain Federal lands in the Alton coal field and adjacent to Bryce Canyon National Park in Southern Utah. As noted in that document, I based my decision on all of the information contained in the administrative record of this proceeding. This record includes the final combined petition evaluation and environmental impact statement document and information provided by the petitioners, intervenors, Federal agencies, the State of Utah, local agencies, industry and members of the public. This document constitutes the Statement of Reasons underlying my conclusion that mining in the designated areas would cause significant cumulative adverse impacts on Bryce Canyon National Park and supporting my decision to reject all of the petitioners' other claims.

II. Background

This decision is the first made under Section 522 of the Surface Mining Control and Reclamation Act of 1977 (Surface Mining Act), 30 U.S.C. § 1272. Section 522 establishes procedures that enable states and the federal government to respond to the conflicts between surface coal mining operations and other uses of land. Section 522 contains two general categories of designation -- statutory designations and designations by petition. Subject to exceptions for valid existing rights and existing operations, mining is statutorily prohibited in certain nationally significant areas (e.g., the National Park System, the National Wildlife Refuge System) and within certain specified distances of dwellings, public buildings, communities and parks and cemeteries. Section 522(e)(1) and (e)(5). Subject to those same exceptions, mining in national forests and near public roads and mining which adversely affects public parks or National Register sites may also be prohibited or limited by the Surface Mining Act. Section 522(e)(2), (e)(3) and (e)(4). Lands within the petition area on which surface coal mining operations are already prohibited under these sections of the statute include Bryce Canyon National Park, the town of Alton and the Alton cemetery.

In addition, Section 522(c) allows any person having an interest which is or may be adversely affected by surface coal mining to petition the regulatory authority to have an area designated unsuitable. The specific procedures for acting on a petition to designate Federal lands appear in Section 522(c) and 30 CFR Part 769. As the regulatory authority for Federal lands (Sections 523 and 701(22)), the Department followed these procedures in acting on the instant petition. See Section III below. The regulatory authority must designate an area unsuitable for all or certain types of surface coal mining operations if the regulatory authority determines that reclamation pursuant to the Surface Mining Act is not technologically and economically feasible. Section 522(a)(2); 30 CFR 762.11(a). The regulatory authority has discretion to designate an area unsuitable if mining operations will (1) be incompatible with existing state or local land use programs, (2) affect fragile or historic lands by causing significant damage to important historic, cultural, scientific, and esthetic values and natural systems, (3) affect renewable resource lands by causing a substantial loss or reduction of long-range productivity of water supply, food or fiber products, or (4) affect natural hazard lands so as to endanger life and property. Section 522(a)(3); 30 CFR 762.11(b). The petition in this case (as described in detail below) states that designation is mandatory under Section 522(a)(2) and also requests designation based on the fragile or historic lands and renewable resource lands criteria of Section 522(a)(3)(B) and (C).

The boundaries of the entire petition area enclose approximately 325,200 acres or slightly more than 500 square miles of land in Southern Utah. About 203,900 acres, excluding Bryce Canyon National Park, are in Federal ownership. About 16,300 acres are owned by the State of Utah and 68,600 acres are privately owned. Page I-1 of the Southern Utah Petition Evaluation Document (PED). By law the petition applies only to the Federal lands within the petition area. <u>See</u> map attached as Appendix A; <u>see</u> <u>also</u> Figure IIB8-1 at PED II-12a.

III. CHRONOLOGY

On November 28, 1979, the Environmental Defense Fund, Friends of the Earth, Sierra Club Legal Defense Fund, Sylvan Johnson, Leon Lippincott, Caroline Lippincott, Jet Mackelprang, Cynthia Myers, Susan Hittson and Larry Little submitted to the Department's Office of Surface Mining Reclamation and Enforcement (OSM), a petition to designate certain Federal lands in southern Utah unsuitable for surface coal mining operations. The petition was found to be complete on December 27, 1979. Notice of receipt of the complete petition was published on January 17, 1980. 45 F.R. 3398. The notice described in detail the lands in the petition area.

On April 24, 1980, OSM published notice of intent to prepare a statement of coal resources, demand for coal, and impact of the designation in accordance with Section 522(d) of the Surface Mining Act, in combination with preparation of an environmental impact statement. 45 F.R. 27836. That notice described the major issues derived from the petition and, in addition, gave notice to the public of a scoping meeting to be held on May 6, 1980. At the public meeting, relevant issues to be addressed by the combined statement were raised by citizens.

The Surface Mining Act provides that designation of Federal land shall be within the exclusive authority of the Secretary of the Interior after consultation with the states involved. Section 503(a)(5). Under the Department's regulations implementing the Surface Mining Act the OSM Regional Director within whose region the petition area is located normally is delegated the authority to issue the final written decision on a petition. 30 CFR 769.18(b). However, by Federal Register notice of May 20, 1980, I announced that I would exercise my retained authority to make the decision in this important and novel proceeding. 45 F.R. 33738.

To aid in preparing the combined petition evaluation and environmental impact statement document, studies of the potential impacts of surface coal mining operation in the petition area, particularly as identified in the petition and at the scoping meeting, were conducted by various federal agencies and contractors. The petitioners and intervenors also conducted studies of potential impacts of such mining. On September 12, 1980, OSM announced the availability to the public of the draft combined petition evaluation and environmental impact statement document. 45 F.R. 60495. That notice summarized available information, including related NEPA reviews, as well as the information generated by the new studies. The notice required comments on the draft document to be received by October 15, 1980, and announced the times and format of the public hearings on the petition, noting that anyone wishing to speak would be given the opportunity to do so.

On September 16, 1980, Utah International, Inc. (UII) and Nevada Electric Investment Company filed with OSM a petition in intervention to the original petition. Each of these companies holds federal coal leases in the Alton coal field and within the petition area. The lands in these leases are hereafter referred to as the Alton leasehold or leasehold. On September 26, 1980, Gary A. Kalpakoff, Joan A. Kalpakoff, Henry Carroll, Norman H. Carroll and East Canyon Irrigation

Company filed with OSM an intervention petition supporting the original petition. On October 3, 1980, an amended petition was filed that removed the names of Henry Carroll and Norman Carroll.

The public hearings on the petition were held on September 29, 1980, at Kanab, Utah; on September 30, 1980, at Kanab and Panguitch, Utah; and on October 10, 1980, at Kanab. Testimony at the hearings was received by a panel of officials from the Office of the Secretary, OSM, and Office of the Solicitor. Members of the panel asked clarifying questions at the conclusion of witnesses' testimony. Attendance at the hearings totalled nearly 600 persons and 102 witnesses were heard. Witnesses included numerous local citizens, the intervenors, and representatives of various local and Federal agencies and the State of Utah.

On October, 16, 1980, OSM extended the comment period for written comments on two reports. 45 F.R. 68762. The reports, a U.S. Environmental Protection Agency noise study report and a UII air quality report, were not submitted until the October 10, 1980, hearing. Because of the length and detail of the reports, the comment period on the two reports was extended until October 20, 1980.

More than 100 written comments were received during the public comment period. Commenters included industry, environmental groups, citizens, and local, State and Federal agencies. As required by 30 CFR 769.4(a), I have solicited and obtained the views of the appropriate State and local agencies. In addition, I obtained the detailed recommendations of Governor Matheson of Utah. Letter of Scott M. Matheson to Paul Bodenberger, OSM, dated October 14, 1980. All substantive comments were considered and the comments and responses to them are included in the final combined petition evaluation and environmental impact statement document.

On November 26, 1980, OSM announced the availability of the final combined petition evaluation and environmental impact statement document. 45 F.R. 78816. The notice described the document itself, as well as the procedure for obtaining copies. The document was pub-published in two volumes: the text, Southern Utah Petition Evaluation Document (PED) and the comments with responses, Southern Utah Petition Evaluation Document - Comments and Responses (PED Comments). The notice also indicated that a decision on the petition would follow shortly. On December 16, 1980, I issued my decision on the petition.

IV. BRYCE CANYON NATIONAL PARK AND DIXIE NATIONAL FOREST ISSUES

A. Allegations of Petitioners and Intervenors

Petitioners alleged, under Section 522(a)(3)(B) of the Surface Mining Act, that surface coal mining operations in the petition area would significantly damage Bryce Canyon National Park, Dixie National Forest and other fragile lands. Specifically, petitioners alleged that:

1. Surface coal mining operations in part of the petition area would cause significant adverse visual impacts on Bryce Canyon Nationa Park. Those impacts would include mining activities, raw and disturbe earth, dust plumes from mining operations and potentially permanent alteration of the vegetation visible from the park (Pet. ¶24);

2. Surface coal mining operations would produce noise and

industrial odors that would diminish the experiences of visitors to the park (Pet. ¶24);

3. Surface coal mining operations would significantly increase ambient particulate concentrations in the vicinity of the park, which would impair scenic attractions in the park, as well as the vistas from the park (Pet. ¶25);

4. Blasting associated with surface coal mining operations could harm the erosional formations for which Bryce Canyon is famous (Pet. ¶26);

5. Surface coal mining operations would disrupt the park's natural systems and destroy local wildlife habitats (Pet. ¶27);

6. Surface coal mining operations would damage important esthetic and recreational values in Dixie National Forest, including hiking, camping, hunting and fishing; and mining operations would impair vistas and visibility, increase noise and disrupt wildlife habitats of the forest (Pet. ¶¶28-29);

7. Surface coal mining operations would destroy the present diverse vegetation of the petition area and severely disrupt the natural systems of the petition and adjacent areas, irreparably damaging wildlife habitats and the ecological, esthetic and recreational values of the Alton area (Pet. ¶30).

In response, the intervenors who opposed the unsuitability petition contended:

1. Surface coal mining operations would not adversely affect lands within the park or forest and would not adversely affect the ex- experience of visitors to the park or forest. In particular, no

harmful effects on erosional structures, odor levels, animal migration or habitat, or air quality within the park or forest would result from surface coal mining operations in the petition area (UII Pet. Int. ¶28);

2. Any such adverse impacts that might be found must be balanced against loss of coal supplies and injuries to the local economy that would result from designation of all or part of the petition area as unsuitable for surface coal mining operations (UII Pet. Int. ¶27);

3. The Surface Mining Act contains no authority for the creation of buffer zones around Bryce Canyon National Park in the absence of competent scientific evidence supporting designation of such lands as unsuitable for surface coal mining operations (UII Pet. Int. ¶29).

B. Description of Bryce Canyon National Park

The authorities establishing and enlarging Bryce Canyon National Park explicitly refer to, and direct the preservation of, the scenic values of the park. Presidential Proclamation No. 1665, 43 Stat. 1914 (June 8, 1923); letter to House Committee from the Department of the Interior, incorporated into H.R. Rep. No. 554, 68th Cong., 1st Sess. 2 (1924); Presidential Proclamation No. 1952, 47 Stat. 2455 (May 4, 1931). In addition, the Clean Air Act Amendments of 1977, 42 U.S.C. §§ 7401 et seq., grant the Secretary of the Interior authority and responsibility for protecting the air quality related values of class I Federal areas, which include Bryce Canyon National Park. These values are defined as visibility and those scenic, cultural, biological and recreational resources of a park that are affected by or dependent on air quality. Thus, Bryce Canyon National Park's charter and subsequent legislation require preservation of the park for the enjoyment of present and future generations and preservation of the scenic, visibility and air quality resources of the park. See PED I-5 to I-6.

Bryce Canyon National Park comprises approximately 34,715 acres of the petition area. PED II-12. The park receives about 620,000 visitors each year who use the park for sightseeing, hiking, camping, horseback riding and other activities. The park is used throughout the year, though most visits are from May through September. PED II-17.

The park is a Class I attainment area under the Prevention of Significant Deterioration (PSD) increment system of the Clean Air Act Amendments of 1977, which means that very little deterioration of its ambient air quality is allowed. The park has some of the highest visual ranges in the United States. Typically, points as distant as 150 kilometers (93 miles) are visible. PED II-3. Yovimpa Point and the Southern Amphitheater, located in the southern portion of the park, offer vistas including such features as the Kaiparowits Plateau, Navajo Mountain, the Kaibab Plateau, the Coral Pink Sandunes, the Kanab Canyon system and the Grand Staircase. Also, about 2,000 acres of the Alton leasehold are visible from Yovimpa Point, extending 5 to 11 miles from the Point. PED II-4.

Measurements by EPA have indicated that background sound levels at Bryce Canyon National Park are comparable to those in a high-qualit sound studio. The park is the quietest area yet measured in EPA's Region VIII. PED II-17. In some areas, the background noise levels are below the level of detection of current sound recording instruments. PED II-18.

Bryce Canyon is famous for its exceptional erosional features. Its bedrock is characterized by a complex system of "master" joints and differences in erodibility among rock layers. These have resulted in the formation of the fantastic walls and pinnacles (also called "hoodoos") for which the park is reknowned. PED II-10.

The most common wildlife species in the petition area are mule deer, cottontail rabbit, mourning dove, blue grouse, cougar, wild turkey, band-tailed pigeon, beaver, pronghorn antelope and sage grouse. A variety of other large and small mammals inhabit the area. PED II-} The Utah prairie dog, which is protected under the Endangered Species Act of 1973, 16 U.S.C. §1361, inhabits a small area in the northwester corner of the petition area. Bald and golden eagles, protected under the Bald Eagle Protection Act, 16 U.S.C. §668, also may be found in the petition area. Certain migratory bird species, protected under the Migratory Bird Treaty Act, 16 U.S.C. §703, inhabit the forests within the petition area. PED II-16.

The southern and northern portions of the petition area have bee surveyed for wildlife values. The southern portion is characterized by high-priority and, in the Dixie National Forest, critical wildlife values. The northern portion exhibits mostly substantial or limited wildlife values. In addition, deer summer and winter ranges are located within the petition area. While deer herds tend to move from summer to winter range along creek bottoms through the petition area, the petition area contains no mass migration corridors. PED II-15.

The East Fork Virgin River has limited fishery values, but is classified as sportfish waters. This river flows into the Virgin River, which is of critical value to the woodfin minnow, a federall listed endangered species. The Virgin River roundtail chub, which being considered for listing as an endangered species, and the Virg River spinedace, which the Utah Department of Wildlife Resources considers a declining species, also are present in the Virgin River. PED 11-16.

C. Findings

My findings that relate to impacts on Bryce Canyon National Pa and the Dixie National Forest are based upon consideration of the full administrative record of this proceeding. This record include the PED, as well as information provided by the petitioners, intervenors, Federal agencies, the State of Utah, local agencies, indust and members of the public in the form of petitions, materials submitted for the record, testimony at the public hearings, and all written comments received up to the close of the comment period on October 20, 1980.

1. Air Quality

The record does not support petitioners' allegation that partiulate concentrations in the park's air would increase by as much as 29 ug/m^3. Pet. Ex. 4, ¶6. The record on air quality impacts cons primarily of three studies. Analyses of the probable air quality pacts of mining the petition area were prepared by EPA Region VIII OSM, by Environmental Research and Technology, Inc. (ERT) for UII the Sierra Club Legal Defense Fund. The EPA and ERT studies were based on information supplied by UII concerning its proposed methods for mining its leasehold.

EPA Class I and Class II PSD increments for fugitive dust emissions were utilized in the PED as a device for comparing the results of these studies. In response to the invalidation of EPA's prior fugitive dust PSD regulations in Alabama Power Company v. Costle, 602 F.2d 1068 (D.C. Cir. 1979), EPA has exempted surface coal mining operations as sources of fugitive dust emissions for PSD purposes. 45 F.R. 52675 (August 7, 1980). Accordingly, the PSD increments for Class I and Class II areas were utilized only as references; they have not been used to determine whether surface coal mining in the petition area might result in violations of these incremental standards.

The EPA study (discussed at PED III-2 to III-4) yielded predictions for 1994, the year of maximum mining activity, and 2014 when mining would be closest to the park. The EPA study predicted that annual total suspended particulate (TSP) concentrations in the park would not exceed 5 ug/m^3, the Class I annual PSD increment. PED figures IIIB1-2 and IIIB1-3 at PED III-4a and III-4b. The study did show that 24-hour particulate concentrations might exceed the 24-hour Class I PSD standard on 1 or 2 days per year in the southeast corner of the park. PED III-3 to III-4.

The ERT study (discussed at PED III-4 to III-5; see also PED Comments at 390-393 (comments of UII)) utilized the same emission rates, particle size distributions, control efficiencies and meteorological data used in the EPA study, but employed a different diffusion modeling approach. The particulate concentrations resulting from the ERT study were below both the annual and 24-hour Class I increments. PED Table IIB1-3 at PED III-6a.

The study conducted by the Sierra Club used different modeling assumptions than were used in the EPA and ERT studies. PED III-5. Th Sierra Club concluded that the 24-hour Class I increments would be ex- ceeded by mining near the park. PED Table IIIB1-4 at PED III-6a. How ever, the Sierra Club modeling (1) did not consider mining operations other than dragline operations, (2) assumed a mining rate three times that planned by UII in the eastern part of the Alton leasehold, (3) as sumed that mining would occur within 5 km of the park although 7 km is a more realistic distance, and (4) used a dragline emission rate that is higher than the rate used by EPA. Corrections for these factors would tend to reduce the 24-hour concentrations to near the Class I increment level. PED III-5.

Based on these studies and the PED, I find that (1) the annual average TSP concentrations in the park would not exceed the Class I annual PSD increments and (2) the 24-hour Class I PSD increments would be exceeded in the park only rarely and only in one area. I find that these small increases in particulate concentrations do not in themselves constitute a basis for an unsuitability determination.

2. Visibility

The petition alleges that increased ambient particulate concentrations caused by surface coal mining operations in the petition are would impair visibility in the park and reduce visual ranges from viewpoints in the park. As explained below, the record demonstrates that mining in the petition area would lead to impairment of visibility, particularly with respect to views from the park in the direction of active mining operations near the park.

Three visibility studies were conducted with respect to potential mining of the petition area. Each of these studies focused on impacts to the south-facing scenic overlooks of the park, especially Yovimpa Point. Yovimpa Point is the developed scenic overlook from which mining activities would primarily be visible. The study conducted by Systems Applications, Inc. (SAI) for EPA (discussed at PED III-6 to III-7) indicated a strong possibility of perceptible, localized impairment of the view from Yovimpa Point caused primarily by dust plumes resulting from mining activities. Because of the transient nature of the dust plumes, however, the photo analyses of the potential visual impact of mining on the view from Yovimpa Point that were enclosed in the PED do not reproduce the visual effects of dust plumes. PED Comments at 121 (OSM response to comments of Environmental Defense Fund). The SAI study showed that plumes would be perceptible as whitish-gray clouds or large layers that would be visible against the darker tree-covered background of the view from Yovimpa Point. The largest and most visible plumes would occur infrequently and usually during the early morning, but plumes would be visible near mining operations two-thirds of the daylight hours. SAI concluded that the plumes would reduce visual ranges in the direction of the plumes. PED III-6 to III-7 and Figure IIIB2-1 at PED III-6b. The light and moderate winds characteristic of the petition area would contribute to frequent reductions of visual range. PED III-7.

- SAI predicted insignificant increases in regional haze as opposec to localized plumes. PED III-7. This prediction was corroborated by the ERT study performed for UII, which concluded that, under worst case conditions, regional haze would noticeably reduce visual ranges in the direction of mined areas only 1 percent of the time. PED III-7. This conclusion is consistent with the SAI prediction of visual reductions in the direction of plumes because the SAI study focused o the visual impact of plumes, while the ERT study was concerned with r gional visibility. PED Comments at 358-359 (comments of Sierra Club and Friends of the Earth) and 394-395 (comments of UII).

A Sierra Club study evaluated the visibility impact of a single dragline. Using two different assumed particle size distributions, the study predicted visual range reductions from the dragline operation. PED III-7. However, the accuracy of the particle size distribution which formed the basis for the larger visual range reduction was not adequately demonstrated. Insufficient information was provided to confirm that the downwind monitors used in the separate stu which derived the distribution were placed so as to record representa tive particle size distributions or that the distribution was representative of typical emissions from a dragline. PED III-7; <u>see</u> PED Comments at 357-358 and 361-362 (comments of Sierra Club and Friends of the Earth) and 157-158 (comments of ERT). The Sierra Club study did show that dust plumes created by a dragline would be dense enoug so that viewers from the park would see opaque plumes near the plume point of origin, thus obscuring the view beyond the plumes. PED III-8.

Based upon these three studies, I find that the park's visibilit would be impaired by surface coal mining operations in the petition area. Some reduction in visual range from the park to the south is likely. Plumes resulting from surface coal mining would reduce visua range in the directions of the dust plumes created by mining. Therefore, I have concluded that surface coal mining operations whose plum would be visible from the park, especially from mining operations eas and south of the park, would have severe impacts on visibility from t park.

3. Visual Resources

The record demonstrates that surface coal mining operations in the portions of the petition area nearest Bryce Canyon National Park would adversely impact the significant visual resources of the Park a well as its visibility. Visibility refers to the clarity and visual range of the views in and from the park, whereas visual resources ar the scenic objects, such as the Grand Staircase, Kaiparowits Plateau Navajo Mountain, and the relatively unspoiled scenery visible in and around the park. Adverse impacts on visibility include reductions i clarity and visual range; adverse impacts on visual resources includ visible uncharacteristic activities that are visible from the park and obstruction of scenic objects.

The record shows that surface coal mining operations in the eas ern part of the Alton leasehold, due south of the park, would result in approximately 25 years of visual intrusion upon the visual resour of the park. Blasting and operation of heavy mining equipment would generate dust plumes in this area that would be visible from Yovimpa

Point and other south-facing park overlooks. PED III-11. During mining in the eastern part of the Alton leasehold, visibility from Yovimpa Point could be reduced so that portions of the landscape from five to fifteen miles from Yovimpa Point could be obscured by plume blight (visible emissions traceable to the source of the plume). PED III-11 to III-12; see also visibility finding above.

Much of the eastern portion of the Alton leasehold is visible from Yovimpa Point. See Figure IIB3-1 at PED II-4a. In addition, other vista points in the park overlook potentially surface mineable areas outside the Alton leasehold east and south of the park. PED III-12. Surface coal mining activities in any of these areas, particularly dragline operations, would be visible to park visitors using these overlooks until mining activities in each area are terminated. PED III-9 and III-12. Moreover, for some years following commencement of reclamation operations, viewers would be able to perceive differences in landscape color and texture and see that these areas had been altered, although, this effect would lessen over time as the reclaimed areas become fully revegetated. PED III-12 to III-13. Thus, I find that there will be adverse visual impacts on the park and its esthetic values if portions of the petition area, as described in paragraph 1 of my decision, are ever mined and that surface coal mining operations would adversely affect those areas because they are fragile lands, as defined in 30 CFR 762.5

4. National Park Services Visitor Survey.

The National Park Service (NPS) conducted a survey at Bryce Canyon National Park from mid-June to mid-September, 1980. The survey was designed to determine: (1) why visitors go to Bryce Canyon National Park; (2) what visitors perceive as the important values of the park; and (3) how visitor enjoyment of the values might be affected by surface coal mining operations near the park. The methodology and results of the visitor survey are described in the PED at III-8 to III-11, V-2 through V-20, and in the NPS report of September, 1980 entitled Results of the NPS-Visitor Survey Conducted at Bryce Canyon National Park - Summer 1980.

The survey received heavy criticism during the comment period, mostly from UII. In particular, K.L. Berry, a social psychologist hired by UII to analyze the survey, presented extensive comments. NPS responded to these criticisms. The specific criticisms and responses appear in the PED Comments at 405, 452-470, 673-680 (comments of UII including K.L. Berry and Frank K. Vance); 38-39 (comments of NPS); 65-66 (comments of the State of Utah); and 79-80 (comments of Garfield County Commission).

These critics did not dispute, however, that hundreds of thousands of people do visit Yovimpa Point and other points overlooking potentially mineable areas in the petition area. Nor did they dispute that views of surface coal mining operations in the eastern Alton leasehold would have adverse impacts on many visitors. I have treated the NPS survey as a source of broad trends but have not relied on it for specific numbers. PED Comments at 405 (response of NPS to comments of UII). These trends identified by the survey are as follows: park visitors value clean (fresh) air, scenic views, rock formations and solitude; and degradation of these values would decrease their enjoyment of visits to the park and reduce their time spent in the park. Thus, the survey confirms my finding that surface coal mining operations in the designated portions of the Alton leasehold would ha an adverse impact on the experiences of visitors to Bryce Canyon Nati al Park and result in significant damage to the esthetic values of th park and surrounding area, especially the extraordinary scenic qualit

5. Fish and Wildlife Resources

Petitioners' allegation regarding the destruction of wildlife and wildlife habitats by surface coal mining operations in the petition area are not supported by the administrative record. A number of potential impacts were presented by petitioners or discussed in the PED, but none will result in irretrievable destruction of wildlif resources. There are generally two types of impacts on wildlife and fish: those resulting directly from the mining operations and those resulting from reclamation after the mining operations have terminate

Four direct impacts of mining were identified by petitioners and the PED:

1) Destruction of wildlife due to general human activity (PED III-35);

2) Loss of habitat, and thus destruction of wildlife, due to the presence of mining operations (PED III-34);

3) Destruction of wildlife due to loss of water resources (Pet. ¶14); and

4) Destruction of wildlife due to the disruption of migration patterns (Pet. ¶27).

The PED indicates that, while reduced populations will result from increased human activity in the area and from the loss of habita no adverse long-term impact is anticipated. PED III-26. The annual disturbance resulting from mining operations would be limited and temporary because the area would be mined in blocks and reclamation would occur concurrently. Ibid.; see also PED Comments at 21 (statement of District Manager, BLM Cedar City, Utah, District Office). I is therefore doubtful that increased activity or loss of habitat wil cause sufficient destruction of wildlife to support a finding of unsuitability.

The effect of surface coal mining operations on water resource in the petition area is discussed in detail in Section V B of this Statement. Depletion of the flow in the East Fork Virgin River by pumping ground water from the Navajo Sandstone aquifer might advers affect endangered and other species in the Virgin River (the woodfi minnow, Virgin River roundtail chub and Virgin River spinedace). P III-35. Available data are not sufficient, however, to determine t extent of the adverse impact on wildlife that might result from pum water from the Navajo aquifer. PED III-36; Section V B 4 below. N are there sufficient data to support a finding of unsuitability bec of adverse impacts on wildlife. Any future specific proposals to c duct surface coal mining operations in the Alton leasehold will be viewed in compliance with Section 7 of the Endangered Species Act U.S.C. § 1536) in order to determine potential adverse effects of ing on fish and wildlife. See, e.g., 30 CFR 779.20, 780.16 and 81

I also find that the surface coal mining operations will not rupt migration patterns for the mule deer from summer to winter ra Although major movements of deer occur within the petiton area, no migration corridors can be identified. The winter range south of

Alton leasehold is sufficiently widespread to permit the deer to circ[illegible] vent any mining operations. PED III-35; <u>see also</u> PED Comments at 21 (comments of UII). Furthermore, the Utah Big Game Range Inventory in[illegible] cates that deer which summer in Bryce Canyon usually winter in the Sevier and Virgin River drainages rather than south of the coal field PED III-35.

Two potential wildlife impacts after mining were identified by petitioners:

1) Non-native plant species introduced in the revegetation efforts will invade the park and alter the natural plant communities within the park (Pet. ¶27); and

2) Revegetation will destroy the diverse vegetative mosaic of the area (Pet. ¶30).

Non-native plant species may be used to revegetate the mined areas. PED III-25. However, the Department's regulations already contain stringent requirements to ensure that introduced plant speci[illegible] do not interfere with natural systems. 30 CFR 816.111 and 816.112. [illegible] addition, non-native species have been introduced by BLM in close proximity to the park and there is no indication that these species [illegible] invading the park despite their close proximity to it. PED III-25 t[illegible] III-26; <u>see also</u> PED comments at 20-21 (statement of BLM District Ma[illegible] ager).

The PED indicates that, rather than destroying the current vege[illegible] tative diversity, revegetation will increase it and provide for improved forage. PED III-29 to III-30. The creation of open-spaces w[illegible] provide a diversity of foods not currently available to the wildlife community. The creation of a maximum "edge" (the border between wooded and non-wooded areas) will particularly benefit the summer range of the mule deer. Moreover, a variety of predators would also be benefited by the increase in open space. PED III-34 to III-35; see also PED Comments at 60-61 (comments of the State of Utah). Thus, I have concluded that reclamation after mining will not adversely affect wildlife.

In summary, I find that the administrative record does not substantiate the petitoners' allegations that wildlife in the petition area will be adversely impacted by surface coal mining operations.

6. Impact on Hoodoos.

Petitioners allege that surface coal mining operations in the petition area would threaten the delicate erosional formations and unique vertical features, known as "hoodoos," that are located within Bryce Canyon National Park. (Pet. ¶¶23 and 26). In particular, petitioners claim that "vibrations from blasting operations could be transmitted directly to these formations, causing their destruction." (Pet. ¶26). Studies performed to determine the validity of these statements, however, indicate that blasting from mining operations will have no adverse impact on the park's erosional formations.

In support of their claims, petitioners cite a letter dated November 28, 1979, from Glen Bean, Regional Director of the National Park Service, Rocky Mountain Region, to the Sierra Club Legal Defense Fund and the Environmental Defense Fund. In his letter, Mr. Bean speculated that "[t]he delicately carved limestone spires are indeed fragile; blasting, as a part of the mining operations, may cause seismic waves and air overpressure which could damage rock formations inside the Park." (Pet. Ex. 3) (emphasis added).

As further noted by Mr. Bean in his letter, OSM and NPS conducted a study designed to predict the effects of blasting on the hoodoos. The methodology used in the study is described in the PED in Chapter V, Section C. The techniques employed in the study are described as representing the state-of-the art. PED V-21 to V-26. The results of this investigation are summarized in the PED: "[V]ibration associated with blasting from the proposed Alton mine will have no adverse impact on the erosional forms of the Bryce Canyon National Park or Dixie National Forest." PED III-32; see also 9/29-30/80 Tr. at 110 (statement of James Thompson, NPS). The record contains no other evidence supporting petitioners' claims and includes another study which supports the conclusion that blasting will not adversely affect the hoodoos. L. L. Obriand examined this potential problem for UII and concluded that "the proposed blasting operations will have no detrimental effect on the erosional features of Bryce Canyon National Park." PED Comments at 227, 231 and 236-243 (statement of L. L. Obriand). I therefore conclude that blasting from mining operations will not harm the hoodoos.

7. Noise

The petition alleges that surface coal mining operations in the Alton leasehold and other petition areas near Bryce Canyon National Park would adversely impact the experiences of visitors to the park due to noise from mining machinery and blasting. Pet. ¶24. The park currently is one of the quietest places in the United States, with background noise levels in some areas that are undetectable by sound recording instruments. PED II-17 to II-18. Because Bryce Canyon National Park is extremely quiet, noise intrusion from sources external to the park will be particularly noticeable to visitors in the park. PED II-18 to II-19.

The 170-ton trucks and scrapers used in surface mining will be the principal equipment that produces noise. Truck noise from surface mining activities in the Alton leasehold alone can be expected to increase significantly the nocturnal sound levels at Yovimpa Point and other areas of the park during summer months. PED Figures IIIB11-1 and IIIB11-2 at PED III-38b and III-38c. Even at the farthest point in the Alton leasehold which is visible from Yovimpa Point, trucks will be distinctly audible throughout the park 10 percent of the time in the early morning hours. PED III-37; Figure IIIB11-2 at PED III-38c. During the daytime in the summer, truck noise from mining operations in the portion of the Alton leasehold nearest to the park will be perceptible throughout much of the park. PED III-37; Figure IIIB11-3 at PED III-38d. Truck noise from daytime summer operations at the farthest point in the Alton leasehold visible from Yovimpa Point would be audible mainly by persons on trails south of Yovimpa Point. PED III-38; Figure IIIB11-4 at PED III-38e. Truck noise from mining operations east of the park in the vicinity of Horse Mountain, Willis Creek and Sheep Creek will have a greater impact on the park than would operations anywhere in the Alton leasehold. PED III-39; Figure IIIB11-7 at PED III-40d.

Truck noise generated in the western portion of the Alton leasehold will have a less significant impact due to greater distances fro: the park and the intervening topographical barriers. PED III-38 to III-39. Thus, truck noise from mining operations in the area of the Alton leasehold farthest from the park would be distinctly audible in the southwestern part of the park during summer only 10 percent of th time in the early morning. Figure IIIB11-5 at PED III-40b. That noise would be marginally perceptible in the southwestern part of the park during the evening 50 percent of the time. PED III-39; Figure IIIB11-6 at PED III-40c.

Blasting is the other major source of noise associated with surface mining that would affect the park. The methodology utilized by OSM in the prediction of blasting noise impact on the park is described at PED III-39 to III-40. The analysis addressed the three types of blasting used in surface mining; they are, in order of loudness, parting blasting, coal blasting and overburden blasting.

Because blasting noise travels over long distances, the effect of atmospheric absorption must be considered in determining noise levels. In particular, the effect of winds in increasing or decreasing blasting noise impact on the park was considered. The results of OSM's analysis of blasting noise impact on the park during the summer months are found in PED Tables IIIB11-2 through IIIB11-8 at PED III-4 III-40e and III-42a and Figure IIIBII-8 at PED III-40f.

The Committee on Hearing, Biacoustics, and Biomechanics of the National Research Council (PED III-40), has issued recommended criter for assessing noise impacts on critical use areas such as national parks. Based on its criteria, surface mine blasting noise generated anywhere in the Alton leasehold would create significant adverse impacts in the park during summer months whenever 10 m.p.h. winds blow from the Alton leasehold toward the park, which is a characteristic condition. PED III-40 to III-41. When winds are not blowing or blow from the park towards the leasehold, as occurs during early evening, only blasting noise from the eastern portion of the leasehold would ac versely impact the entire park. PED III-40. Blasting noise from the western portion of the leasehold would not significantly impact high use areas of the park, except that parting blasting noise would adversely impact trails and campsites throughout the park. PED III-40.

In summary, OSM's analysis of expected truck and blasting noise indicates that surface coal mining operations in the eastern portion the Alton leasehold can be expected to cause significant adverse nois impacts on the park. Mining east of the park would have an even more severe adverse impact on the park. However, truck noise from mining in the western portion of the Alton leasehold would seldom adversely affect visitors to the park. Blasting noise from the western portior of the Alton leasehold would not usually have an adverse impact on high use areas of the park, although parting blasting noise from thi: area would adversely affect trails and campsites in the park. I the: fore conclude that surface coal mining operations in the portions of the petition area south and east of the park, including the eastern portion of the Alton leasehold, would significantly damage the excep tional sound qualities of the park. I also conclude that noise from mining operations in the petition area to the west of the eastern portion of the Alton leasehold would not significantly damage the soun qualities of the park.

8. Dixie National Forest.

The U.S. Forest Service manages an estimated 57,200 acres within the boundaries of the petition area known as the Dixie National Forest PED II-12. Petitioners allege (Pet. ¶28) that "surface coal mining op erations would also damage important aesthetic and recreational values in Dixie National Forest which include hiking, camping, hunting, and fishing." They allege that mining activities would impair visibility and air quality values and diminish the recreational value of the forest lands. (Pet. ¶29). UII claims that petitioners have not adequately supported their claims regarding impacts on forest lands. PED Comments at 429 (comments of UII). The Forest Service recommende rejection of the petition as it related to National Forest System lands. Letter from Regional Forester, U.S. Forest Service, to Region Director, OSM, Denver, dated October 21, 1980.

The Department's studies show that proposed mining activities would adversely affect the recreational and visual resources of the Dixie National Forest. PED III-4, III-33, III-36, and III-39. Moreover, because Dixie National Forest and Bryce Canyon National Park are contiguous within the petition area (see PED Figure IIIB8-1 at II-12a), the adverse impacts of mining on the park, as discussed abov are equally applicable to the forest. For the reasons stated above, therefore must designate the Dixie National Forest lands within the petition area which are contiguous to the park as described in paragraph 1 of my decision. This designation does not apply, however, to portions of the forest within the petition area and west of R. 4W, nor to portions of the forest outside the petition area. In T. 36S, R. 2W, underground mining operations may be allowable, subject to the requirements of Section 522(e)(2) of the Surface Mining Act.

Conclusion

All of the evidence before me, including comments, hearing testimony, the PED and other materials, demonstrates that surface coal mining operations in most areas east and south of the park, including the eastern portion of the Alton leasehold, will adversely impact the visibility, visual resources and noise levels of Bryce Canyon National Park. The park now possesses exceptionally clean air and offers views characterized by their high visual range and unique, interesting features. In addition, the park is one of the quietest places in the United States.

For these and all of the above-stated reasons, I find that coal mining by surface methods, and coal mining by underground methods, where the surface impacts would be visible from Bryce Canyon National Park, on Federal lands in townships T. 40S, R. 4W; T. 39S, R. 4W; T. R. 3W; T. 37S, R. 4W; T. 37S, R. 3W; and T. 36S, R. 3W, of the Salt Lake Meridian, would significantly damage the values for which Bryce Canyon National Park was created. Designation of this area affects Federal coal leases U 0115938, U 0122582, U 0122623, U 0122647, U 012 U 0122650, U 0122651, U 0122652, U 0124768, U 0126916, U 0149582, and part of U 098774, all held by UII. I also find that coal mining by surface methods on Federal lands in townships T. 36S, R. 2W, of the S Lake Meridian, would significantly damage the values for which Bryce

Canyon National Park was created. Designation of this area affects Federal coal lease SL 071561, held by Caesar Fulton.

I reject, however, all of petitioners' allegations relating to impacts on the air quality, fish and wildlife and erosional forms of Bryce Canyon National Park. In Section V below, I explain my reasons for rejecting petitioners' other claims that do not relate to alleged damage to the park.

V. OTHER REJECTED PETITION CLAIMS

As stated in paragraph 4 of my decision of December 16, 1980, I have rejected some of petitioners' claims. These claims are as follows: (1) the lands within the petition area cannot be reclaimed as required by the Surface Mining Act (Pet. ¶¶2, 3, 11-20); (2) surface coal mining operations could affect renewable resources resulting in a substantial loss or reduction of long-range productivity of water supply, food or fiber products (Pet. ¶¶2, 3, 31-34); and (3) alternative energy sources to the Allen-Warner Valley Energy System, such as conservation, solar, cogeneration, geothermal, wind and hydropower, could provide more energy with fewer environmental and economic costs (Pet. ¶¶4, 35-38).

A. Reclamation of Lands Within the Petition Area.

Petitioners stated that these lands "could not be reclaimed after surface coal mining operations" (Pet. ¶2). As a result, petitioners alleged that I must designate these areas as unsuitable under Section 522(a)(2) of the Surface Mining Act and 30 CFR 762.11(a).

Petitioners contended that revegetation of the petition area after surface coal mining operations will be impossible or highly unlikely. They attacked the numerous studies and other evidence of revegetation success in the petition area as not representative of the soils and other conditions (topography, size of disturbed area, climatological information) that will be present after the proposed mining Petitioners also stated that successful revegetation will not occur because of lack of topsoil, lack of suitable overburden and adverse climatological factors. The Forest Service, Bureau of Land Managemer (BLM), and intervenors vigorously defended the methodology and conclusions of the studies. Utah believed that reclamation is not only possible, but would enhance the wildlife and grazing capabilities of the area.

1. <u>Studies of Soils and Revegetation</u>.

None of the land within the petition area has ever been disturbed by large scale surface coal mining operations. PED III-26. Numerous studies of the soils and the potential for revegetation of the petition area have been conducted. These studies include the Energy Mineral Rehabilitation Inventory and Analysis (EMRIA) evaluatio (a cooperative study by the BLM, Bureau of Reclamation and Geologica Survey), revegetation studies by Dr. Neil Frischknecht and Robert Ferguson (U.S. Forest Service), in cooperation with BLM and UII, and and soils studies by BLM, UII and the NUS Corporation. Revegetation data have also been developed from chained and/or plowed areas. The areas are Alton, Black Rock, Deer Springs, Swallow Park and First Point. Removal of existing vegetation by chaining, spraying or plow is a common practice used to improve the utility of the land for grazing. PED III-24. Climatological information was gathered by the Geological Survey and UII.

Petitioners and other commenters objected to the use of these data stating that the soils in the areas studied are flat, well-draine rich, sandy loams ideally suited for plant growth. In contrast, they stated, the areas that will be mined are steep and stony and the reconstructed soils in these areas will be a poor medium for growth. In addition, petitioners claimed that management practices such as chaining do not disturb the natural soils as do the earth-moving operations associated with mining. Petitioners also claimed that many of the areas studied by the Forest Service and BLM are too small to produce the representative data necessary to study the potential for reclamation.

Although the studies did not precisely simulate the conditions associated with mining, revegetation has been successful in large area of surface disturbance (chaining) and in the smaller plots where soil movement and redistribution were used to simulate major surface disturbances. PED III-26. In addition, the studies have shown that chemical and physical characteristics of soils in the EMRIA study area are very similar to the major soils found in the Alton area. PED III-26 and Table IIIB6-7 at PED III-26b. Significant vegetative cover was established in all of the areas studied. In the majority of areas studied, the vegetative cover either exceeded or was not significantly different from the major plant communities existing within the petition area. PED III-24 and III-25. The methodology for determining vegetative cover is described in the PED, Chapter V, Part B. Petitioners' statements regarding potential insect infestation and slow growth rates are not substantiated. PED III-24 and III-25.

As stated in the PED, it is appropriate to extrapolate from these studies in order to determine whether revegetation after mining is feasible. PED Comments at 588-590 (response to comments of Robert Curry). Based upon the numerous studies, the variety of study conditions and the fact that no vegetation type conversions have failed within the petition area during the past 20 years, I conclude that petitioners' contentions on this issue must be rejected.

2. Topsoil.

Petitioners claimed that insufficient topsoil exists in the petition area to support successful revegetation and that the physical and chemical characteristics of the overburden (including sodium content and lack of nutrients) will inhibit plant growth. As noted above, a large amount of information about the soils in the petition area can be used to evaluate this contention. Even assuming disturbbance of all 16,747 acres containing surface strippable coal (PED III-27), the studies show that sufficient "good" and "fair" material is available for replacement on the stripped area to a depth of six inches and sufficient "poor" material is available for replacement to a depth of 23 inches. The characteristics of the "good," "fair," and "poor" categories of reconstructed soils for drastically disturbed areas are shown on Table IIIB6-10 at PED III-28d. This estimate of about 30 inches for the total depth of suitable plant growth material is further substantiated by UII's study which shows that 22 to 37 inches of suitable material is available for reclamation. Western Ecological Services Co., July 1980, PED VIII-12; see also PED Comments at 420 (comment of UII). These depths may be increased with the use of approved overburden materials as a supplement to or substitute for topsoil. 30 CFR 816.22(e).

Petitioners also claim that topsoil stored in piles during mining operations is subject to some erosion and degradation of biological activity. Current regulations, however, require that temporary topsoil piles be protected from erosion and contaminants. 30 CFR 816.23; PED III-28. Petitioners' allegation that topsoil suffers biological degradation when stored for long periods is not supported by current dat PED III-28. I therefore conclude that the petition area contains sufficient topsoil that is suitable for plant growth to support successfu revegetation of surface mined areas.

3. Overburden.

Three studies, the EMRIA report cited above, the SWA report prepared for UII, and a study of 18 drill holes performed by UII, have demonstrated that suitable overburden for reclamation exists in the petition area. PED III-28. Estimates of the depth of suitable plant growth material in the petition area ranged from 15 to 298 feet. PED III-28. These studies, however, do substantiate petitioners' claims that the overburden has a high sodium content. The effects of a high sodium content (measured as sodium absortion ratio--SAR) are detailed in Dr. Coats' affidavit, Pet. Ex. 2 ¶¶10-11. The problems of sodic overburden can be controlled, however, by burial under topsoil and better quality overburden. Burial with four feet of good quality overburden or comparable treatment is required by applicable regulations. 30 CFR 816.103; PED III-29. Such burial or treatment should suffice because studies show that burial with far less good quality topsoil (only 5 cm.) can substantially reduce sodic damage. While upward movement of sodium may occur over time, research suggests that proper burial mitigates the effects of this migration. PED III-29. Dr. Frischknecht has found no increase in sodium in four years of testing soil samples. Tr. 9/29-30/80, p. 89.

Accordingly, I conclude that suitable overburden for reclamation exists in the petition area.

4. Vegetation Diversity.

Petitioners claimed that non-native species should not be permitted to spread to Bryce Canyon National Park and interfere with the park's natural systems. Pet. Ex. 2 ¶26. They also argued that any attempted reclamation will be lacking in vegetation diversity. Pet. Ex. 2 ¶27.

Revegetation with native species is required by the Surface Mining Act, although introduced species may be used if it is shown that they will not interfere with natural systems. 30 U.S.C. § 1265(b)(19 Non-native species have been introduced in the study areas close to Bryce Canyon National Park. These species of plants have not been shown to be a threat to the park. PED III-26.

Specific diversity tests on the vegetation in the petition area were conducted by OSM. Tabulated results appear in Tables IIIB6-11, IIIB6-12, and IIIB6-13 at PED III-29 to III-30. These studies indicate that the vegetation communities are generally more evenly distributed within the areas that have been revegetated than in the existing communities of the petition area. PED III-30. It is significant that this distribution occurred even though the revegetated portions of the study area were planted with seed mixtures containing onl one or two species. PED Comments at 419 (comments of UII). Seed mix design will be critical to the achievement of postmining vegetation diversity requirements; however, numerous different species have been successfully established on experimental plots within the petition area. Table IIIB6-14 at PED III-30b.

I therefore reject petitioners' claims that non-native species should not be used in revegetation and that revegetation would result in a lack of vegetation diversity.

5. Climate.

Petitioners stated that the climatic conditions in the area also would impede revegetation because large storms common to the area woul increase erosion and replacement of forest cover with alternating area of grassland and bare soils would cause changes in climate ("dessication"). Pet. ¶18. Variability in precipitation and evaporation make irrigation essential for plant growth but an adequate supply of suitable water for irrigation is not present. The available water is of poor quality and its use would aggravate the sodium and erosion problems associated with reconstructed soils. Pet. ¶19.

Severe spring thunderstorms, accompanied by high winds, and less severe summer convective storms occur in the petition area. Such storms can cause significant damage, including erosion. PED II-2, III-32. Furthermore, the drying or "dessication" effect caused by the increased surface temperatures of disturbed soils and wind may be enhanced when the predominant pinyon-juniper community is removed. PED III-32. However, substantial surface acreage within the petition area has been disturbed and successfully revegetated. These revegetation successes have occurred over long periods of time (10-20 years) and on plots of land ranging from 2,000 to 3,300 acres, surface disturbances which far exceed the annual disturbance of potential mining operations assumed in the Department's analysis. PED II-9, III-32. Furthermore, these areas have been successfully revegetated under a variety of weather conditions and no large scale revegetation failures have been reported or observed. PED II-32; PED Comments at 600-601 (response to testimony of Robert Curry).

Petitioners' claim that disturbed areas will have to be irrigated is also refuted by the available evidence. The annual precipitation characteristic of this area (PED II-2, III-27 and Table IIIB6 at PED III-28c) is apparently sufficient for revegetation since large disturbed areas in this region have been successfully reseeded withou[t] the aid of irrigation. PED III-31. Petitioners and other commenters characterize the precipitation of the last four years (when the studi[es] were conducted) as atypical. PED Comments at 324 (comments of Sierra Club Legal Defense Fund) and 601 (testimony of Robert Curry). They suggest that more representative data is available in sources analyzi[ng] the historical weather conditions in the region and in Utah. Ibid. The Department has relied on site-specific data obtained from the surrounding areas rather than "precipitation data extrapolated from r gional or State averages." PED Comments at 599 (response to testimon of Robert Curry). These precipitation measurements, together with 20 years of success on chained areas and experimental plots without the aid of irrigation, demonstrate that vegetation can be established on disturbed soils in this area under natural weather conditions. I therefore find that petitioners have not shown that climatic conditions will be an insurmountable barrier to successful revegetation of disturbed soils in the petition area.

B. Hydrologic Balance.

Petitioners claimed that surface coal mining operations in the petition area would irreparably harm the hydrologic balance and water quality and quantity both within and without the petition area. Pet. ¶¶12-15. Such operations allegedly would destroy and permanently alt aquifers and associated springs (including the Navajo Sandstone aquifer) which are the principal sources of water for many important land uses in the area. Pet. ¶13. Agricultural activity would be adversely affected because the essential hydrologic functions of alluvial valley floors would be altered and damaged. Pet. ¶15. The erosion, flooding and sediment caused by mining operations and aggravated by revegetation failures would adversely affect streams in the area and result in loss of pasture and cropland. Pet. ¶15.

The quality and quantity of water is a major concern in the State of Utah and is of special concern in the petition area. Springs and wells in the area are important sources of water for agricultural, livestock and other uses. PED II-5 to II-6. The major ground water resource in the petition area is the Navajo sandstone aquifer, an aquifer of good chemical quality. PED II-7 to II-8. While the Department's studies suggest that mining operations may alter the hydrologic balance in and around the petition area, uncertain, insufficient and conflicting data concerning the hydrologic balance preclude accurate assessment of potential changes or adverse impacts, at least until specific mining and reclamation plans/permit applications are evaluated in the future. PED Comments at 301 (response to comments of Sierra Club Legal Defense Fund). I therefore find, as described below, that petitioners' contentions that surface coal mining operations would adversely affect the hydrologic balance are not supported by the record.

1. Destruction of Aquifers and Associated Springs

The Department's studies indicate that proposed mining operations will not destroy all local aquifers as claimed by petitioners. Only parts of one localized aquifer -- the aquifer in the Dakota sanc stone coal-bearing formation -- would be destroyed by mining. PED I: 14. Other local aquifers that supply springs in the petition area w: not be affected because a 650-700 foot shale barrier separates the ac fers from the coal-bearing material that will be mined. PED III-14. This separation is graphically displayed in Figure IIA-2 at PED II-2:

Extensive information is available on springs in the area. PED III-13. Of the 44 springs in or near proposed mining areas that are shown in existing reports and on existing maps, 20 springs in or nea the Dakota formation would be destroyed or significantly affected, while 24 springs are not likely to be affected. PED III-13. The lc of water for the 20 affected springs is estimated to be 132 acre-feet per year. Ibid. Distribution of replacement water from the affected springs will not be difficult, and there will be sufficient time before loss occurs to conduct necessary studies and provide for water replacement. Ibid. In addition, UII has committed to develop alternative surface water sources as necessary to replace spring waters lost during mining operations. PED Comments at 411-412. Finally, the yields of the unaffected springs are appreciably greater than the yields of the affected springs. The estimated annual yield of the 24 unaffected springs is 550 acre-feet, as opposed to 132 acre-feet for the 20 affected springs. PED III-13 to III-14.

Underground mining in the petition area could cause local water-level declines, changes in direction of water flow, increased discha[illegible] to lower beds and diversion of surface runoff into the ground. PED I[illegible] 15. The amount of diversion would not exceed average annual runoff [illegible] 20 to 25 acre-feet per square mile, but probably would range from ze[illegible] to one-fourth of the annual runoff. PED III-15. Moreover, runoff s[illegible] diverted would not be lost, but would be stored and eventually discharged, probably elsewhere in the same drainage area. PED III-15.

The water needs of an increased population created by mining in the petition area are estimated at 700 acre-feet per year and are probably the only long-term unavoidable impact on water supplies (assuming a long-term increase in population). PED III-15. UII assert that consumptive use of water by humans should be considered "a long term beneficial and best use" of the resource. PED Comments at 412. Water supplies for increased population would have to be developed or diverted from present uses. Ibid. The deep ground-water source of the Navajo sandstone aquifer has not been developed or appropriated for use by the State of Utah. PED II-8. The effects on the Navajo sar stone aquifer discussed below would be increased proportionately if ar additional 700 acre-feet per year were pumped from it. PED III-15.

I find that the record does not support petitioners' allegations that mining in the petition area would destroy all local aquifers and associated springs.

2. Alluvial Valley Floors.

The Department sponsored a study which identified alluvial valle floors that may underlie agricultural portions of the petition area. This 1980 study by Jack C. Schmidt, Earth Resources Consulting, updat a 1977 study that found no alluvial valley floors in the Alton coal lease area. PED Comments at 133-134 (comments of Environmental Defen Fund) and 32 (Comments of UII). The location of possible alluvial valley floors is depicted in Figure IIB4-1 at PED II-8a. No commenter (including the petitioners and intervenors) has been able to determin whether the "essential hydrologic functions" of alluvial valley floors, as defined at 30 CFR 701.5, in the petition area will be damaged. The Surface Mining Act and applicable regulations require, however, that any future mining in these areas must be conducted so as to preserve or reestablish the essential hydrologic functions of identified alluvial valley floors. Sections 510(b)(5) and 515(b)(10); 30 CFR 785.19 and 822. A final determination on this issue will thus be made in reviewing specific mining and reclamation plans/permit applic tions in the future. I find that sufficient evidence is not availabl upon which to determine whether mining in the petition area will damage the essential hydrologic functions of alluvial valley floors.

3. Erosion and Effects on Streams Channels.

The record does demonstrate that surface coal mining operations in the petition area will cause increased erosion and surface runoff. This short-term impact would result from the removal of vegetation, topsoil and overburden handling and road construction associated with mining. PED III-15 and III-16. Reclamation activities such as regrading have similar effects. In particular, the longer post mining slopes resulting from regrading steep slope areas and the decreased infiltration on reclaimed lands may cause an increase in erosion. PED III-16. In turn, increased sediment in streams may change the sediment-carrying characteristics and locations of receiving streams. Ibid.

The presence of significant amounts of gravel in the stream beds of all major streams crossing strippable lands in the petition area and applicable regulations (concerning post mining topography, stabilization of gullies and rills created by erosion and general hydrologic balance) would limit long term effects on stream channels. Ibid.; 30 CFR 816.41-.57 and .100-.106; PED Comments at 24 (comments of BLM Cedar City, Utah, District Office) and 299 (comments of Sierra Club Legal Defense Fund). Furthermore, the record contains strong evidence that revegetation of mined areas will be successful. See findings on soils and revegetation above. Accordingly, any short term erosion and sediment effects will decrease and productivity of soils will increase as slopes become stabilized and vegetation reestablishe

I therefore conclude that surface coal mining operations in the petition area will not cause long term adverse erosion and sediment effects, and that the short term impacts of mining will not inhibit reclamation of mined areas.

4. The Navajo Sandstone Aquifer.

The relationship between the coal within the petition area and the proposed Allen-Warner Valley Energy System is described in the Bureau of Land Management's environmental impact statement on that system. Allen-Warner Valley Energy System Final Environmental Impact Statement (AWV EIS), Volume 1, Chapter 2. Briefly, under the AWV proposal, coal within the Alton leasehold would be crushed, cleaned and combined with water at a preparation plant to form a coal slurry. AWV EIS, Volume 1, p. 2-5. The coal slurry would be pumped from the preparation plant in two separate steel 12-inch diameter pipelines to two power plants. Water needed for the preparation plant and coal slurry pipelines would be supplied from deep wells drilled in the Navajo sandstone aquifer. Ibid.

The State of Utah (PED Comments at 56 and 72), El Paso Coal Company (PED Comments at 107) and UII (PED Comments at 435-436) have steadfastly maintained that the question of pumping water from the Navajo sandstone aquifer for the slurry pipelines is not a proper issue in this designation proceeding, but is an issue solely within the jurisdiction of the State of Utah. In contrast, petitioners have maintained that the slurry system and its potential effects on the Navajo sandstone aquifer must be considered in the context of whether reclamation is technologically and economically feasible (PED Comment at

113-114 (comments of Environmental Defense Fund)) and that pumping i within the Surface Mining Act's definition of "surface coal mining o ations" (PED Comments at 321 (comments of Sierra Club and Friends of the Earth)).

The Department, through the Assistant Secretary for Energy and Minerals, has acknowledged during public hearings that the issue of water rights is within the exclusive domain of the State of Utah and not within the Secretary of the Interior's authority (9/29-30/80 Tr. p. 472-473); see also PED Comments at 663 (response to testimony of John Ferrell). The Department's specific responsibility, if any, to consider the impacts of the proposed coal slurry pipeline on wate quality and quantity (see Section 515(b)(15) of the Surface Mining Act) can only be determined once a specific mining and reclamation plan/permit application is filed.

Petitioners' claims concerning the Navajo sandstone aquifer we analyzed by the Department because petitioners alleged that pumping from the aquifer would adversely affect users who depend on it for water supplies. 9/29-30/80 Tr. p. 473. The PED analysis of this i indicates that pumping water from the Navajo sandstone aquifer for years may adversely affect the quantity of water in springs and wel the petition area. PED III-19. These effects may extend well beyo life of the mine because the petition area's ground water system ha slow response time. Ibid; PED Comments at 35 (comments of National Park Service, Rocky Mountain Regional Office).

As noted in both the PED (III-20) and the AWV EIS (4-3), there conflicting information on the characteristics and recharge capabil of the Navajo sandstone aquifer. As a result, accurate predictions of timing and location of impacts on water quantity could not be made. Se also, PED Comments at 24-25 (comments of BLM, Cedar City, Utah, Distric Office), 123-128 (comments of Environmental Defense Fund) and 293-295 and 297 (comments of Sierra Club Legal Defense Fund)). The Utility Commission of the City of St. George, Utah, reported that it has pumped millions of gallons of water from wells drilled in the Navajo formation with no effect on springs in the area either upstream or dowr stream. PED Comments at 85. Other commenters noted that substantial quantities of water have been pumped from the Navajo sandstone aquifer for many years (PED Comments at 106 (comments of Bingham Engineering)) and that public demand could never exceed the available water in the aquifer (PED Comments at 413 (comments of UII)). Pumping tests and other studies now being performed by UII should provide additional information on pumping effects that can be analyzed in the context of a specific mining and reclamation plan/permit application for the Alton leasehold. PED III-20; PED Comments at 35 (comments of National Park Service, Rocky Mountain Regional Office), 295 (comments of Sierra Club Legal Defense Club) and 436 (comments of UII).

Finally, insufficient data exist to evaluate fully whether loss of good quality water available for public and irrigation use and degradation of aquifer quality by leakage from adjacent areas containing water of poor quality would affect water quality. PED III-19. I therefore conclude that present data are inadequate to determine whether pumping from the Navajo sandstone aquifer would adversely affect present users of the aquifer.

In summary, I find that the record does not support petitioners' allegations that surface coal mining operations would significantly damage the hydrologic balance of the petition and surrounding areas by destroying aquifers and associated springs, by damaging the essential hydrologic functions of alluvial valley floors, by increasing erosion and sedimentation, and by reducing discharge from the Navajo sandston aquifer.

C. Renewable Resource Lands.

Petitioners claimed that I should exercise my discretion to desi nate the petition area unsuitable for surface coal mining operations because proposed mining operations would adversely affect renewable r source lands and result in substantial loss or reduction of long-ranc productivity of water supply or of food or fiber products. Pet. ¶¶ 31-34. "Renewable resource lands" are defined to include "aquifers and areas for the recharge of aquifers and other underground waters, areas for agricultural or silvacultural production of food and fiber and grazing lands." Section 522(a)(3)(C); 30 CFR 701.5 and 762.11 (b)(3).

Petitioners' allegations concerning this designation criterion are closely related to the effects of mining on revegetation and hyd logic balance discussed above. Impacts cited by petitioners include destruction of aquifers and aquifer recharge capacity, accelerated erosion and sedimentation, and withdrawal of water from the Navajo sandstone aquifer. Pet. ¶¶12-15. Based on my prior statements and findings concerning revegetation and hydrologic balance, I decline to designate any of the petition area as unsuitable for mining on the basis of the renewable resource criterion.

D. Alternative Energy Sources.

Finally, petitioners alleged that "the planned AWV System (including the proposed Alton Coal Mine in the affected area) is not necessary to meet electrical energy needs." Pet. ¶36. They drew the conclusion that damage to important resources within the petition area can be avoided by developing other environmentally preferable anc economically superior alternative energy sources, such as solar, conservation, cogeneration, geothermal, wind and hydropower. Pet. ¶¶35 and 36. Several commenters disagreed with petitioners' conclusions thε alternative energy sources are preferable or stated that any considerε tion of such alternatives is more appropriate in the context of the Dε partment's forthcoming decision on the Allen-Warner Valley System. PE] Comments at 56 (comments of the State of Utah), 611 (testimony of Rob Houston), 640 (testimony of Jeannine Holt) and 682 (comments of M. Douglas Ahlstrom).

The issue of alternative energy sources has been evaluated in th PED, as provided by Section 522(d) of the Surface Mining Act and 30 C 769.17(e). This issue was also appropriate for consideration in compliance with the National Environmental Policy Act. 40 CFR 1502.14. Several specific alternatives to the Allen-Warner Valley System have been analyzed in detail in BLM's Environmental Impact Statement on that system. AWV EIS, Volume 1, Chapters 2 and 4.

I have concluded, however, that possible alternative energy sources do not constitute a basis for designating lands unsuitable for mining under Section 522(a) of the Surface Mining Act. Accordingingly, I have deferred consideration of those alternatives to my consideration of the rights-of-way for the Allen-Warner System.

VI. FUTURE FEDERAL ACTION.

Under the terms of my decision dated December 16, 1980, as explained in the above Statement of Reasons, I have designated certain F eral lands unsuitable for surface coal mining operations in order to p vent significant damage to Bryce Canyon National Park. I have decline to designate other areas of Federal lands unsuitable for mining. None theless, it is likely that a variety of future Federal actions may be quested either in undesignated areas or for underground mining in the designated areas. In the future, specific proposals may be received b Federal agencies, such as right-of-way or mineral lease applications c mining claim plan of operations to the Bureau of Land Management, oil and gas drilling permit applications to the U.S. Geological Survey or mine plan/permit applications to the Office of Surface Mining. Whe ever bureaus of the Department receive such applications or requests, they are directed by paragraphs 6 and 7 of my decision to take all nec essary actions to implement this decision, including referral to the National Park Service of applications and requests that may affect Bryce Canyon National Park or the values for which it was established, and to take these factors into account in deciding whether to allow such activities on non-designated Federal lands near the park or underground mining in the designated area.

As set forth in the proclamation establishing Bryce Canyon National Park (Presidential Proclamation No. 1665, 43 Stat. 1914 (June 8, 1923)), the park's significant values are "unusual scenic beauty, scientific interest and importance." This proclamation is reinforced by the mandates of the Act of August 25, 1916 creating the National Park Service (National Park Service Organic Act), as amended, 16 U.S.C. §§ 1,2,3 and 4, to preserve the "scenery and the natural and historic objects and the wildlife therein" and to "leave them unimpaired for the enjoyment of future generations," and the directive of 16 U.S.C. § 1a-1 to protect, manage and administer the park in light of the "high public value and integrity of the National Park System" and in conformity with the values and purposes for which the park was established. In order to fulfill these responsibilities the Department bureaus that review future potential actions on Federal lands must ensure that such activities will not cause significant adverse impacts on Bryce Canyon National Park and that the values for which the park was established will be protected.

On the other hand, exploration for coal and other minerals may be conducted on Federal lands within the designated area and throughout the Alton and Henderson coal fields, so long as the requirements of applicable mining and minerals laws are satisfied. Those laws include Section 522(a)(1) of the Surface Mining Act (30 U.S.C. § 1272(a)(1)), Sections 2(b),8A, 9 and 23 of the Mineral Leasing Act (30 U.S.C. §§ 201(b), 208-1, 211 and 261), Sections 302(b) and 504(f) of the Federal Land Policy and Management Act (43 U.S.C. § 1732(b) and 1764(f)), and Sections 2 and 9 of the Mining in the Parks Act (16 U.S.C. §§ 1902 and 1908). The procedural and substantive requirements for such exploration include the Department's regulations at 30 CFR Part 744 and 43 CFR 3410 and 3416.6

(coal exploration), as well as 36 CFR Part 9 (mining in the parks) and 43 CFR Parts 3045, 3802 and 3809 (other mineral exploration).

On undesignated areas of the Alton and Henderson coal fields whe: Federal coal has already been leased, the lessees must file with OSM specific mining plans/permit applications in order to obtain permissi to conduct surface coal mining. Within the designated area, lessees apply to conduct underground mining so long as that mining will not p: duce surface impacts that are visible from Bryce Canyon National Park except in T. 36S, R. 2W, of the Salt Lake Meridian, where visible sur- face impacts from underground mining may be permitted. See paragraph: 1 and 5 of my decision. In order to obtain approval to conduct minin the lessees must comply with the Department's regulations governing mining on Federal lands (30 CFR Subchapter D), as well as any applic- able regulatory requirements of the State of Utah.

If Utah obtains my approval to assume exclusive jurisdiction over the regulation of surface coal mining and reclamation operations under Section 503 of the Surface Mining Act, it will then be eligible to enter into a cooperative agreement with the Department to regulate mining on Federal lands within Utah. Upon signing such an agreement, Utah would be primarily responsible for implementing and enforcing th permanent regulatory requirements of the Surface Mining Act for coal mining on Federal lands. The Department will still retain authority to approve mining plans, designate lands unsuitable for mining and regulate other activities on Federal lands, as provided in Sections 503(a)(5) and 523(c) of the Surface Mining Act.

Once a mining plan/permit application for the Alton or Henderson coal field is received, it will then be reviewed by the Department and the State of Utah according to applicable State and/or Federal regulations. Upon receipt of an application, public notice will be issued and public hearings conducted pursuant to Section 513 of the Surface Mining Act. Federal, State or local governmental agencies will have an opportunity to file written objections to the application. 30 CFR 786.12.

At that time, the National Park Service and the Office of Surfa Mining will review the application to determine, as required by para graph 5 of my decision, whether mining of these Federal leases would cause adverse impacts on the visual resources and noise levels in Bryce Canyon National Park. They may then recommend that special stipulations or conditions to mitigate such damage be included in the Department's decision on the mining plan/permit application, as provided in 30 CFR 741.18, 761.12 and 786.19.

As to any Federal lands within the designated area that are not ready subject to Federal lease, the Bureau of Land Management shall, under paragraph 7 of my decision, ensure that surface coal mining op tions are limited in accordance with Section 552(b) of the Surface M ing Act. Such limitations may include appropriate conditions on any leasing of the area for coal development or withdrawal of the land f leasing, as provided in 43 CFR 1601.6-6.

VII. LESSEE-INTERVENOR'S CLAIMS OF SUBSTANTIAL LEGAL AND FINANCIAL COMMITMENTS.

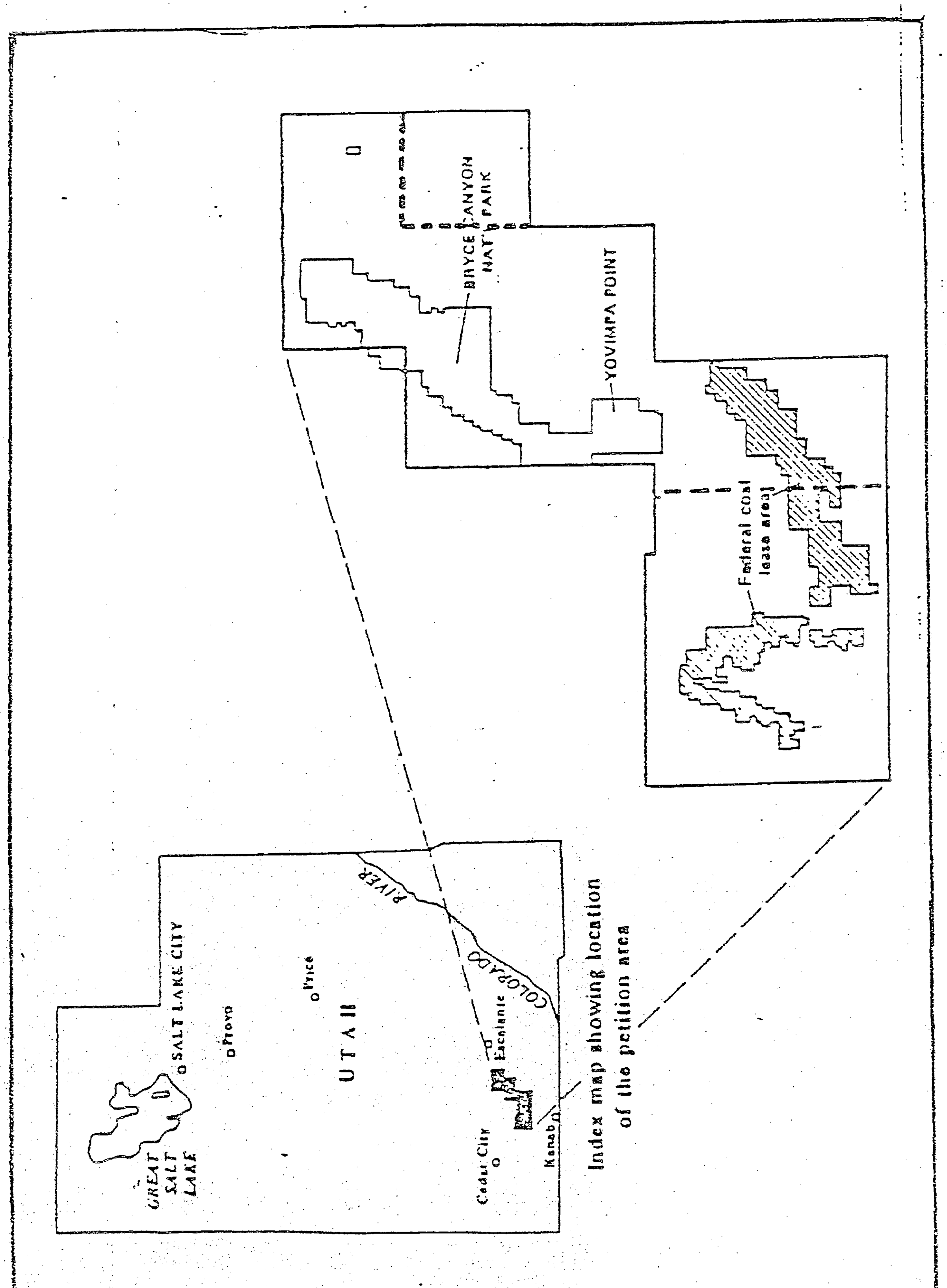
Section 522(a)(6) of the Surface Mining Act provides that an unsuitability designation shall not apply to lands "where substantia legal and financial commitments in [a surface coal mining] operation were in existence prior to January 4, 1977." 30 U.S.C. § 1272(a)(6). I understand that various companies holding leases in the petition area have intervened in this proceeding and have requested determinations by OSM, in accordance with 30 CFR Part 762. A preliminary decision by the Director of OSM on lessees' requests will be published subsequently in the Federal Register. Thereafter, all interested persons will be afforded an opportunity to comment on OSM's preliminary findings and to provide OSM with additional information concerning the requested exemptions. A final decision will then be issued by the Director of OSM, taking into account all such comments. Any appeal of that decision may be taken to the Department's Office of Hearings and Appeals, as provided in 43 CFR 4.1280-4.1286. I will therefore refrain from rendering any decision on those requests because I have delegated to the Board of Surface Mining Appeals the authority to make a final decision for the Department on such matters.

VIII. CONCLUSION.

The provisions of 30 CFR 769.18 will be followed in issuing this statement of reasons. Copies will be sent simultaneously by certified mail to the petitioners, the State of Utah, the intervenors and every other party to the petition proceeding. My decision of December 16, 1980, becomes final upon the date of signing this statement and any appeal from this decision must be filed within 60 days from this date in the United States District Court for Utah, as required by Section 526(a)(1) of the Surface Mining Act, 30 U.S.C. § 1276(a)(1).

1-13-81
DATE

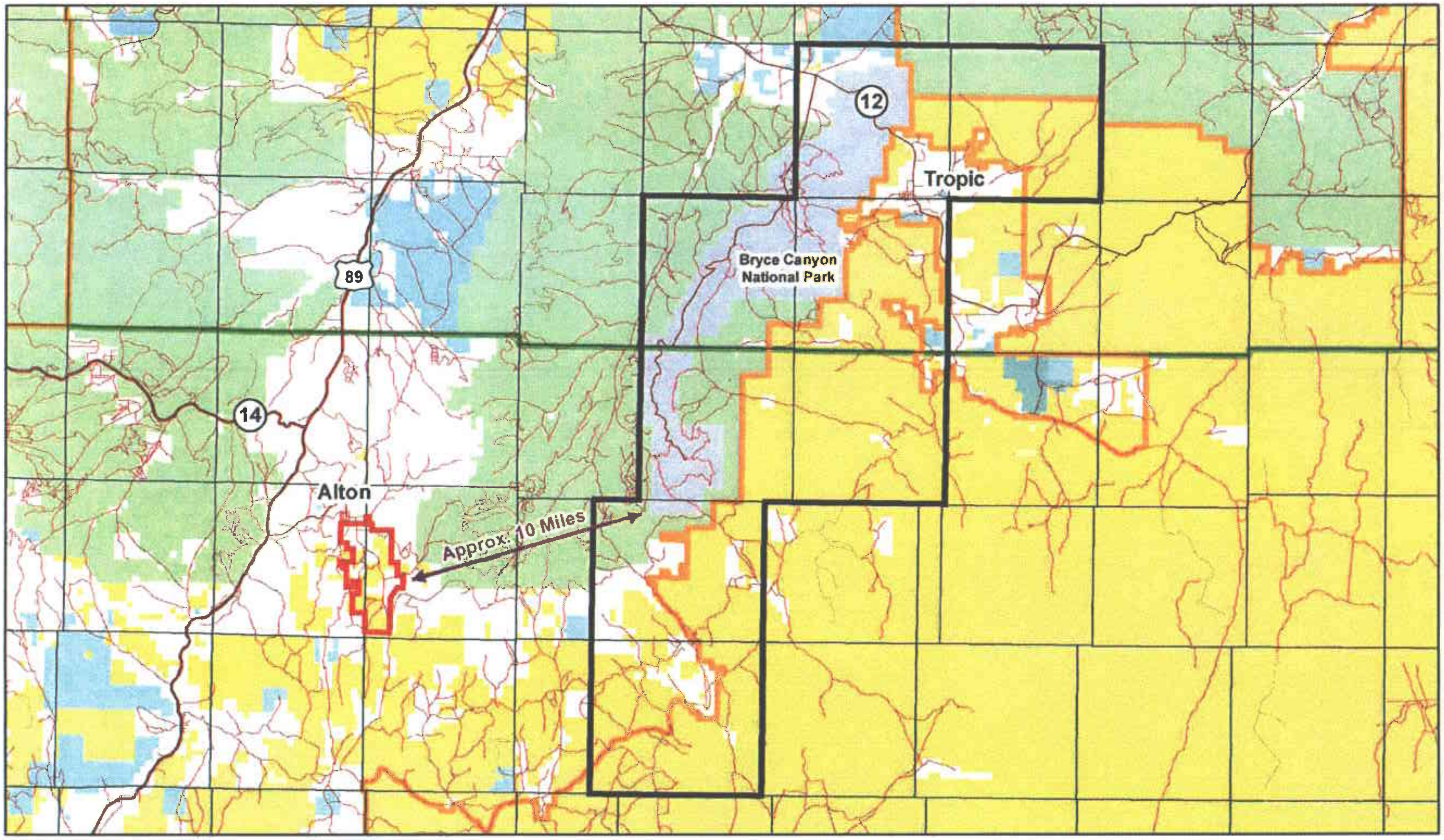
Cecil D. Andrus
CECIL D. ANDRUS


BRYCE CANYON NAT'L PARK
YOVIMPA POINT
Federal coal lease area
GREAT SALT LAKE
SALT LAKE CITY
Provo
Price
UTAH
COLORADO RIVER
Escalante
Cedar City
Kanab
Index map showing location of the petition area

Kanab Field Office, UT
Bureau of Land Management

Alton Coal Project - LBA

November 30, 2006



Public Land
State Land
National Forest
Private Land
National Park

Alton Coal LBA Polygon
Secretarial Decision Area
Field Office Boundary
County Boundary

N

0 1 2 4 Miles
0 1 2 4 Kilometers

No warranty is made by the BLM for use of the data for purposes not intended by the BLM

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

BLM

ALTON MINE PETITION RULING -- Magnified area at right includes the 325,200-acre portion of southern Utah that was studied in the Alton mine petition. Secretary Andrus banned surface mining and surface effects of underground mining in the area nearest to Bryce Canyon National Park. The box area at upper right, cut off by dotted lines, and the portion of the Federal coal lease area at lower left west of the vertical dotted line, would be open to mining under the decision. Shaded area is the Alton coal field. About 10 percent of the mineable coal would be excluded from surface mining by the decision. -- Interior Dept. Map

APPENDIX 1-4

Certificate of Liability Insurance

ACORD. CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 5/31/2007

PRODUCER (435)637-7803 FAX: (435)637-7811
James Banasky Insurance Inc.
6 West Main Street
PO Box 728
Price UT 84501

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
Alton Coal Development, LLC
PO Box 1230
Huntington UT 84528

INSURERS AFFORDING COVERAGE	NAIC #
INSURER A: Federal Insurance Co.	
INSURER B:	
INSURER C:	
INSURER D:	
INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A		GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY PRO-JECT LOC	3586-33-72 DAL	5/19/2007	5/19/2008	EACH OCCURRENCE	$ 1,000,000
						DAMAGE TO RENTED PREMISES (Ea occurence)	$ 1,000,000
						MED EXP (Any one person)	$ 10,000
						PERSONAL & ADV INJURY	$ 1,000,000
						GENERAL AGGREGATE	$ 2,000,000
						PRODUCTS - COMP/OP AGG	$ 2,000,000
A		AUTOMOBILE LIABILITY ANY AUTO ALL OWNED AUTOS X SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS	(07) 7354-18-34	5/19/2007	5/19/2008	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
						BODILY INJURY (Per person)	$
						BODILY INJURY (Per accident)	$
						PROPERTY DAMAGE (Per accident)	$
		GARAGE LIABILITY ANY AUTO				AUTO ONLY - EA ACCIDENT	$
						OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
		EXCESS/UMBRELLA LIABILITY OCCUR CLAIMS MADE DEDUCTIBLE RETENTION $				EACH OCCURRENCE	$
						AGGREGATE	$
							$
							$
							$
		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				WC STATUTORY LIMITS / OTHER	
						E.L. EACH ACCIDENT	$
						E.L. DISEASE - EA EMPLOYEE	$
						E.L. DISEASE - POLICY LIMIT	$
		OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS
Includes use of explosives, C/025/0005.

CERTIFICATE HOLDER

State of Utah
Department of Natural Resources
Division of Oil, Gas & Mining
Salt Lake City, UT

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ~~ENDEAVOR TO~~ MAIL 45 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, ~~BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.~~

AUTHORIZED REPRESENTATIVE

APPENDIX 1-5

Proof of Publication (Proposed)

Upon determination of administrative completeness, the attached newspaper advertisement will be placed in a local newspaper of general circulation in the Alton area at least once a week for four consecutive weeks.

Legal Notice

Public Notice for Permit Application

Notice is hereby Given that Alton Coal Development, LLC is applying for a permit to conduct coal mining operations at the Coal Hollow Mine in Kane County in South Central Utah. The business address for Alton Coal Development is:

Alton Coal Development, LLC
PO Box 1230
615 N, 400E
Huntington, Utah 84528

Alton Coal Development has filed with the Utah Division of Oil, Gas & Mining a Mining and Reclamation Plan (MRP) application. Permit Number C/025/0005. Application has been filed for the Coal Hollow Mine. The Coal Hollow Mine is located approximately 35 miles north of Kanab, Utah (the Kane County seat) and approximately 4 miles south of the town of Alton, Utah.

Project Area Legal Description

All that certain real property situated in Township 39 South, Range 5 West, SLB&M, Kane County, Utah, more particularly described as follows:

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 30: All of Sectional Lot #1 (NW¼NW¼); NE¼NW¼; N½NE¼; ALSO: BEGINNING 3.50 chains West of the East Quarter corner of Said Section 30, and running South 34° 34' West 22.64 chains to the 1/16 section line; thence West 2.64 chains to the Southwest corner of the NE¼SE¼ of Said Section 30; thence North 40.00 chains; thence East 20.00 chains; thence South 14.69 chains; thence southwesterly to the point of beginning

...containing 217.64 acres, more or less.

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 30: BEGINNING at a point 5.31 chains North of the E¼ corner of Said Section 30, and running thence South 45.31 chains; thence West 20.00 chains; thence North 20.00 chains; thence East 2.64 chains; thence North 34° 34' East 22.64 chains to the 1/16th section line; thence North 33° 22' East to the point of beginning.

...containing 61.96 acres, more or less.

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 29: BEGINNING at the Northwest corner of Said Section 29, and running thence South 34.69 chains; thence North 33° 22' East 35.50 chains; thence North 40° West 0.58 chains; thence North 37° 30' East 12.30 chains; thence West 22.23 chains to the point of beginning.

...containing 36.04 acres, more or less.

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 19: SW¼SE¼, E½SE¼, SE¼NE¼

...containing 160.00 acres, more or less.

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 20: SW¼

...containing 160.00 acres, more or less.

The permit application area is located on the Alton, Utah, U.S. Geological Survey 7.5 minute quadrangle map.
The application was filed and this notice is prepared and published to comply with the Surface Mining Control and Reclamation Act of 1977 and State and Federal regulations promulgated pursuant to said act.

A copy of Alton Coal Development's permit application will be filled for public inspection at:

Kane County Clerks Office
70 North main
Kanab, Utah 84741

The State of Utah
Department of Natural Resources
Division of Oil, Gas & Mining
1549 West Temple
Suite 1210
Salt Lake City, Utah 84114-5801

APPENDIX 1-6

A notarized statement attesting to the accuracy

VERIFICATION STATEMENT

STATE OF UTAH)
: **ss**
COUNTY OF EMERY)

I, Allen P. Childs, hereby certify that I am the manager for the applicant, Alton Coal Development, L.L.C., and that the information contained in this application for the Coal Hollow Mining and Reclamation Plan is true and correct to the best of my knowledge and belief, in all respects, with the laws of Utah, specifically in reference to the applicant's commitments, undertakings and obligations herein.

Signed: Allen P Childs
Position: Manager

SUBSCRIBED and SWORN TO by ALLEN P. CHILDS, the Manager of Alton Coal Development, L.L.C., before me this 30 day of May, 2007.

Notary Public: DeeDee R Bell

My Commission Expires: 1-23-09

NOTARY PUBLIC
STATE OF UTAH
My Commission Expires
January 23, 2009
DEEDEE R. BELL
215 South 200 West
PO Box 715
Orangeville, Utah 84537

TABLE OF CONTENTS

Chapter 2

R645-301-200

SOILS

APPENDICES

DRAWINGS

R645-301-200. SOILS

210. INTRODUCTION

211. Soil Removal

In this section, the Alton Coal Project will present a description of the pre-mining soil resources as specified under R645-301-221. Topsoil and subsoil to be saved under R645-301-232 will be separately removed and segregated from other materials.

212. Soil Redistribution

After removal, topsoil will be immediately redistributed in accordance with R645-301-242 and stockpiled pending redistribution under R645-301-234. For details refer to Section 5 of Appendix 2-1.

220. ENVIRONMENTAL DESCRIPTION

221. Prime Farmland Investigation

The Natural Resource Conservation Service conducted a prime farmland assessment in October 2006 and determined that "No Prime Farmland or Soils of Statewide Importance were found within the study area (Coal Hollow Mine area), per criteria outlined in the National Survey Handbook Part 622 and Exhibit UT603-1, respectively (C. Meier, 2006)." The assessment stated that the soils "..could classify as Soils of Statewide Importance, if irrigated.."

"An available and reliable source of moisture to sustain crops common to the area is the primary limiting factor that excludes the observed soils from classifying as Prime Farmland or SSI (C. Meier, 2006)."

"In addition to a lack of a reliable source of water, soils did not classify as Prime Farmland due to high pH, high electrical conductivity, excessive erosion potential on steep slopes and slow permeability (C. Meier, 2006)."

A copy of the NRCS Prime Farmland Determination is included in Section 1 of Appendix 2-1.

222. Soil Survey

An order 2 soils survey has been completed in 2007 at the Coal Hollow Project. Appendix 2-1 contains a report that provides the details for this survey. The survey area is on private lands leased by Alton Coal Development (ACD). This phase of the soil survey was confined to areas proposed to be disturbed during year one of the ACD mine plan. This soil survey was prepared so that ACD could: 1) identify suitable sources of subsoil and topsoil; 2) determine topsoil and subsoil salvage depths and quantities; and, 3) develop a post mining reclamation plan using salvaged soil materials. This soil survey covers 230 acres.

An order 2 soil survey will be completed on the additional portions of the proposed Coal Hollow mine area (years 2 and 3) prior to mining.

222.100. Soils Map

A map with soil map unit delineations is shown on Drawing 2-1.

222.200. Soil Identification

Soils in the Coal Hollow project soil survey area have been grouped into eleven soil map units based on taxonomic classification, depth to parent material, and slope. The composition of these map units is described in table 2-1. Detailed descriptions of each soil map unit are included in Appendix 2-1. The soil survey map is Drawing 2-1.

Table 2-1. Soil map unit composition for the Coal Hollow project year 1 area.

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
1		**A - J families complex, 3 to 8 percent slopes**		
	65	A	fine, mixed, superactive, mesic Aridic Calciustept	1
	15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
	10	D	fine, mixed, superactive, mesic Aridic Calciustoll	33
	5	S	fine, mixed, superactive, mesic Aridic Haplustalf	48
	5	M	fine, mixed, superactive, mesic Aridic Haplustepts	
2		**M - B - D families complex, 3 to 8 percent slopes**		
	60	M	fine, mixed, superactive, mesic Aridic Calciustepts	3
	25	B	fine, mixed, superactive, mesic Aridic Haplustepts	4
	15	D	fine, mixed, superactive, mesic Aridic Calciustoll	2
3		**E - J families complex, 3 to 8 percent slopes**		
	60	E	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6
	30	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
	5	A	fine, mixed, superactive, mesic Aridic Calciustept	
	5	B	fine, mixed, superactive, mesic Aridic Haplustepts	
4		**C - H - J families complex, 3 to 8 percent slopes**		
	50	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17
	25	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39
	15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19
	5	D	fine, mixed, superactive, mesic Aridic Calciustoll	
	5	A	fine, mixed, superactive, mesic Aridic Calciustept	

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
5			**B - M - T families complex, 8 to 25 percent slopes**	
	40	B	fine, mixed, superactive, mesic Aridic Haplustepts	24
	30	M	fine, mixed, superactive, mesic Aridic Calciustept	25
	20	T	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49
	10	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
6			**F - G - C families complex, 1 to 5 percent slopes**	
	45	F	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	9A
	20	G	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B
	20	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16
	15	I	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14
7			**O - R families complex, 1 to 5 percent slopes**	
	55	O	fine, mixed, superactive frigid Aeric Epiaquept	38
	20	R	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A
	10	Q	fine, mixed, superactive, frigid Typic Argiaquoll	43
	10	P	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40
	3	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
	2	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
8			**L - H - K families complex, 3 to 8 percent slopes**	
	40	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22
	30	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20
	20	K	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21
	10	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
9			**D - W families complex, 5 to 30 percent slopes**	
	55	D	fine, mixed, superactive, mesic Aridic Calciustoll	41
	30	W	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42
	10	A	fine, mixed, superactive, mesic Aridic Calciustept	
	5		Creek bottom	
10			**U family, 8 to 25 percent slopes**	
	85	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	50
	10	T	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	
	5	B	fine, mixed, superactive, mesic Aridic Haplustepts	
11			**A family, 8 to 25 percent slopes**	

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
	85	A	fine, mixed, superactive, mesic Aridic Calciustept	28
	10	B	fine, mixed, superactive, mesic Aridic Haplustepts	
	5	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
1	Soil families were given letter designations, because it was not possible to correlate the soils to established soil series since no NRCS published or SSURGO certified soil survey data exists in or adjacent to the Coal Hollow project area. Assignment of soil type letters enables comparison of map units and simplifies map unit names.			
2	Soil families classified using Keys to Soil Taxonomy, Ninth Edition (NRCS 2003).			
3	Soil pedon described within map unit boundaries that represents the characteristics of the soil family within the soil map unit.			

222.300 Soil Descriptions

Based on the order 2 soils survey that was completed on 2007, the following soil map unit descriptions and productivities apply. Additional information describing each soil map unit is contained in Appendix 2-1.

1 A - J families complex, 3 to 8 percent slopes

General Description

Map unit 1 is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997). The depth to Tropic shale is greater than 40 inches in the major soils (A and J), but minor inclusions with Tropic shale from 20 to 40 inches deep occur. The map unit is dominated by big sagebrush and grasses.

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities and establish topsoil and subsoil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
65	A	fine, mixed, superactive, mesic Aridic Calciustept	1*
15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
10	D	fine, mixed, superactive, mesic Aridic Calciustoll	33
5	S	fine, mixed, superactive, mesic Aridic Haplustalf	48*
5	M	fine, mixed, superactive, mesic Aridic Haplustepts	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

Soil colors are for dry soil unless specified otherwise.

The typifying soil pedon for A family soils in map unit 1 is soil pedon 27. The surface is

a grayish brown clay loam 12 inches thick, dark grayish brown (moist). The subsoil (calcic) consists of light brownish gray silty clay, light olive brown (moist). Decomposing Tropic shale occurs at 42 inches below the surface.
The typifying soil pedon for the J family soils in map unit 1 is soil pedon 32. The mollic surface is a brown loam 8 inches thick, very dark grayish brown (moist). The subsurface (argillic) is a pale brown clay loam and silty clay, brown (moist). The subsoil (calcic) is pink loam to 6 feet, brown (moist). The underlying soil to nearly 12 feet is light yellowish brown silty clay over pink coarse sands with 10 percent faint strong brown mottles.

2 M - B - D families complex, 3 to 8 percent slopes

General Description

This map unit is dominated by soils with Tropic shale parent material at 20 to 72 inches below the surface. The map unit is dominated by big sagebrush and grasses with some pinyon pine and Utah juniper encroaching along edges of the map unit near map unit 5. This map unit is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997).

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities. A second small delineation of map unit 2 occurs along the south boundary of the proposed year 1 mining area west of the county road.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	M	fine, mixed, superactive, mesic Aridic Calciustepts	3*
25	B	fine, mixed, superactive, mesic Aridic Haplustepts	4*
15	D	fine, mixed, superactive, mesic Aridic Calciustoll	2*
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for M family soils in map unit 2 is soil pedon 3. The surface is a brown loam 4 inches thick, dark brown (moist). The subsurface (cambic) is a grayish brown clay loam and silty clay loam 15 inches thick, brown (moist). The underlying subsoil to 33 inches is light brownish gray silty clay, light olive brown (moist). Tropic shale parent material occurs at 33 inches below the surface.

The typifying soil pedon for B family soils in map unit 2 is pedon 4. The surface is pale brown silty clay 4 inches thick, dark grayish brown (moist). The subsurface (cambic) is light brownish gray silty clay moderate to strong structure, dark grayish brown (moist) to 31 inches. Tropic shale parent material occurs at 31 inches.

The typifying soil pedon for D family soils in map unit 2 is pedon 2. The surface (mollic) is brown clay loam 12 inches thick, very dark grayish brown (moist). The subsurface (cambic and calcic) is pale brown silty clay and clay to 48 inches deep, brown (moist). The subsoil is white silty clay to 72 inches, brown (moist). Tropic shale parent material occurs at 72 inches below the surface.

3 E - J families complex, 3 to 8 percent slopes

General Description

Map unit 3 is characterized by very deep soils that show some indication of alluvial deposition most likely from the large alluvial fan that formed this portion of Sink Valley. Recent soil deposition from nearby Robinson Creek is indicated in pedon 6 by an increase of organic matter at 12 inches below the soil surface.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	E	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6*
30	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
5	A	fine, mixed, superactive, mesic Aridic Calciustept	
5	B	fine, mixed, superactive, mesic Aridic Haplustepts	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for E family soils in map unit 3 is soil pedon 6. The surface is brown loamy sand 12 inches thick, dark yellowish brown (moist). The subsoil (calcic) is pale brown loam and sandy loam to 34 inches deep, brown (moist). The underlying soil to 60 inches is light grayish brown silty clay, brown (moist).

The typifying soil pedon for J family in map unit 3 is soil pedon 31. The surface (mollic) is dark grayish brown loam 7 inches thick, dark brown (moist). The subsurface (argillic) is light yellowish brown clay loam to 17 inches, dark yellowish brown (moist). The subsoil (lower argillic and calcic) is light brownish gray and brown clay loam and loam to 52 inches, grayish brown and brown (moist). The underlying soil to 110 inches is very pale brown sandy loam and loamy sand, brown and yellowish brown (moist).

4 C - H - J families complex, 3 to 8 percent slopes

General Description

Map unit 4 is characterized by very deep fine-loamy and coarse-loamy soils with mollic epipedons and calcic horizons. Lime accumulations below 12 to 22 inches are common in these soils. Soil pH is strongly alkaline below 22 inches in some soils. Vegetation in this map unit is big sagebrush and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
50	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17*
25	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39*
15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19*
5	D	fine, mixed, superactive, mesic Aridic Calciustoll	7*
5	A	fine, mixed, superactive, mesic Aridic Calciustept	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for C family in map unit 4 is soil pedon 17. The surface (mollic) is a brown clay loam 9 inches thick, dark brown (moist). The subsurface (cambic) is a pale brown clay loam to 18 inches, brown (moist). The lower subsurface (Bwk) to 45 inches is light yellowish brown loam and clay loam, dark yellowish brown (moist). The underlying subsoil (calcic) is very pale brown clay loam and silty clay to 80 inches, yellowish brown (moist).

The typifying soil pedon for H family in map unit 4 is soil pedon 39. The surface is brown clay loam 12 inches thick, dark brown (moist). The subsurface (calcic) is a very pale brown to light yellowish brown sandy loam to 36 inches deep, yellowish brown (moist). The underlying subsoil is a very pale brown very cobbly loamy sand to 75 inches, brown (moist).

The typifying soil pedon for J family in map unit 4 is soil pedon 19. The surface (mollic) is a grayish brown loam 6 inches thick, very dark grayish brown (moist). The subsurface (upper argillic) is a brown and pale brown clay loam to 24 inches deep, dark grayish brown and yellowish brown (moist). The lower subsurface (lower argillic and upper calcic, Btk) is a pale brown loam to 37 inches deep, brown (moist). The underlying subsoil (calcic) is a pale brown and light yellowish brown sandy loam to 90 inches deep, yellowish brown (moist).

5 B - M - T families complex, 8 to 25 percent slopes

General Description

These soils are moderately deep (20 to 40 inches) to shallow (less than 20 inches to Tropic shale. The moderately deep soils have clayey textures, while the shallow soils are loamy. Vegetation is pinyon pine, Utah juniper, black sage and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
40	B	fine, mixed, superactive, mesic Aridic Haplustepts	24*
30	M	fine, mixed, superactive, mesic Aridic Calciustept	25*
20	T	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49*
10	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for B family in map unit 5 is soil pedon 24. The surface is olive brown clay 5 inches thick, dark grayish brown (moist). The subsurface (cambic) is dark grayish brown and olive clay with moderate to strong blocky structure to 32 inches. Tropic shale parent material is at 32 inches.

The typifying soil pedon for M family in map unit 5 is soil pedon 25. The surface is covered with a half inch of decomposing needles and twigs. The soil surface is light brown clay 5 inches thick, brown (moist). The subsurface (calcic) is brown and strong brown clay with lime accumulations, dark brown (moist). Tropic shale parent material is at 32 inches.

The typifying soil pedon for T family in map unit 5 is soil pedon 49. The surface light yellowish brown silty clay loam 3 inches thick, light olive brown (moist). The subsoil is a light olive brown loam to 10 inches, olive brown (moist). Interbeded sandstone and Tropic shale are at 10 inches.

6 F - G - C families complex, 1 to 5 percent slopes

General Description

These medium to coarse textured soils are very deep. Wet soil conditions are present at varying depths in all of the map unit soils. The depth to wet soil conditions varies from 14 to 58 inches. This map unit is not a good source of subsoil. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is grasses, sedges, and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	F	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15*
20	G	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B*
20	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16*
15	I	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14*
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for F family in map unit 6 is soil pedon 15. There is a dense root mat 1 inch thick on the surface. The surface is brown sandy loam 8 inches thick, dark brown (moist). The subsurface (cambic) is pale brown loam with moderate structure, dark yellowish brown (moist). The subsoil (calcic) is very pale brown loam to 58 inches deep, yellowish brown (moist). The underlying soil is yellow and brownish yellow sandy loam with common prominent mottles to 96 inches, yellowish brown (moist).

The typifying soil pedon for G family in map unit 6 is soil pedon 9B. The surface is dark grayish brown loam 6 inches thick, very dark grayish brown (moist). The lower surface is grayish brown sandy clay loam to 14 inches with few faint mottles, dark grayish brown (moist). The subsurface is light brownish gray sandy loam with common prominent mottles, dark gray (moist). The subsoil is light gray sandy loam with many prominent mottles, grayish brown (moist). The soil was wet below 48 inches.

The typifying soil pedon for C family in map unit 6 is soil pedon 16. There is a dense root mat 1 ½ inch thick on the surface. The surface is dark grayish brown silty clay loam 8 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 18 inches, strong brown (moist). The subsoil is pink clay loam to 36 inches, brown (moist). The lower subsoil is pink silty clay loam and loam with few faint strong brown mottles to 68 inches, brown (moist). The underlying soil is light brownish gray clay loam with common prominent yellowish red mottles, grayish brown (moist).

7 O - R families complex, 1 to 5 percent slopes

General Description

This soil map unit is located on an alluvial terrace that is underlain by Tropic shale. It is located on the east side of the Sink Valley fault. Soils are characterized by clay and a high water table that is perched on top of the heavy clay soils. The high water table is at or within a foot of the soil surface during the wet period of the year. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is sedges and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	O	fine, mixed, superactive frigid Aeric Epiaquept	38*
20	R	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A*
10	Q	fine, mixed, superactive, frigid Typic Argiaquoll	43
10	P	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40*
3	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
2	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for O family soils in map unit 7 is soil pedon 38. The surface is dark grayish brown (moist) silty clay 6 inches thick. The subsurface is a yellowish brown (moist) silty clay 6 inches thick. The calcic horizon begins at 12 inches below the surface and is a light yellowish brown (moist) to very pale brown (moist) silty clay. The calcic horizon continues to 48 inches or deeper. The water table was at 29 inches when the pit was described in March 2007. Mottles and gleyed soil were observed below 12 inches. Vegetation is grasses, sedges, widely scattered Wyoming big sagebrush, and wild rose.

The typifying soil pedon for R family in map unit 7 is soil pedon 18A. The mollic surface is a very dark grayish brown (moist) loam to 7 inches. The cambic horizon is a brown (moist) loam to 15 inches deep. The calcic horizon is a light olive brown (moist) sandy loam to 30 inches. The underlying soil is grayish brown (moist) clay loam and sandy clay loam to 60 inches deep. Mottles were observed below 7 inches. The water table was at 51 inches when the described in September 2006.

8 L - H - K families complex, 3 to 8 percent slopes

General Description

These soils developed in very deep alluvium on the east side of the Coal Hollow project area. They are medium to coarse textured. Evidence of a fluctuating water table was observed in most soils below 48 to 60 inches, depending on location and physiographic setting. This map unit would be a good source of cover material, but most of the disturbance in this area will be limited to cover soil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Dominant Vegetation	Typifying Soil Pedon
40	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf		22*
30	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll		20*
20	K	coarse-loamy, mixed, superactive, mesic Aridic Calciustept		21*
10	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll		
* Lab analysis of typifying soil pedon for map unit.				

Typifying Soil Pedon Descriptions

Colors are for dry soil unless other wise noted.

The typifying soil pedon for the L family soil in map unit 8 is soil pedon 22. The surface is pale brown sandy loam to 6 inches. The argillic and upper calcic horizon is a light yellowish brown silty clay loam and sandy clay loam to 28 inches. The underlying soil is very pale brown sandy loam to 84 inches. Mottles increase significantly below 48 inches indicating that there is fluctuating water table during wet years. This soil supports Gamble oak, snowberry, grasses, and forbs.

The typifying soil pedon for the H family soil in map unit 8 is soil pedon 20. The surface is brown loam to 6 inches. The cambic horizon is light yellowish brown clay loam to 13 inches. The calcic horizon is very pale brown to light yellowish brown sandy loam and loamy sand to 54 inches. The underlying soil is a light yellowish brown loam to 72 inches and loamy sand to 96 inches. This soil supports Pinyon pine, Utah Juniper, Gamble oak, and snowberry.

The typifying soil pedon for K family soil in map unit 8 is soil pedon 21. The surface is a light yellowish brown sandy clay loam to 8 inches. The calcic horizon is a pale brown sandy clay loam to 18 inches. The underlying soil is a pale brown strongly alkaline sandy loam to 96 inches. This soil was described in an opening of Wyoming big sagebrush within a larger area of Gamble oak.

9 D - W families complex, 5 to 30 percent slopes

General Description

These clayey soils are very deep and dominated by clayey textures. They have a dark surface (mollic epipedon). The D family soil has an increase in lime at 6 to 12 inches below the surface, while the W family soil has similar levels of lime throughout the soil profile. Soils in this map unit appear to have developed from the large alluvial fan that covers most of Sink Valley. The map unit is delineated along Robinson Creek and in an area south of the creek that could be the remnants of a historic channel. Vegetation is dominantly big sagebrush, rabbitbrush, and grasses with pinyon pine and Utah juniper encroaching from adjacent areas.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	D	fine, mixed, superactive, mesic Aridic Calciustoll	41*
30	W	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42*
10	A	fine, mixed, superactive, mesic Aridic Calciustept	
5		Creek bottom	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for the D family soil in map unit 9 is soil pedon 41. The surface is brown sandy clay loam to 6 inches, dark brown (moist). The lower surface is brown clay to 12 inches, dark brown (moist). The subsurface (cambic) is pale brown silty clay to 36 inches, brown (moist). The subsoil (calcic) is very pale brown silty clay loam and sandy loam to 80 inches, yellowish brown (moist).

The typifying soil pedon for W family soil in map unit 9 is soil pedon 42. The surface is brown loam 9 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 24 inches, brown (moist). The upper subsoil (lower cambic) is pale brown sandy clay loam to 36 inches, brown (moist). The lower subsoil is light yellowish brown loam to 48 inches, yellowish brown (moist).

10 U family 8 to 25 percent slopes

General Description

These clayey soils are shallow to Tropic shale and formed along the Sink Valley escarpment. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	U	Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	50*
10	T	loamy, mixed, superactive, nonacid, mesic Aridic Lithic Ustorthent	
5	B	fine, mixed, superactive, mesic Aridic Haplustepts	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Description

The typifying soil pedon for the U family soil in map unit 10 is soil pedon 50. The surface is light brownish gray clay to 4 inches, dark grayish brown (moist). The subsurface is light brownish gray clay to 19 inches, dark grayish brown and olive brown (moist). Tropic shale is at 19 inches.

11 A family, 8 to 25 percent slopes

General Description

These soils are very deep and are on the footslope and backslope of the Sink Valley fault escarpment. Vegetation is grasses, rabbitbrush, and big sagebrush.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	A	fine, mixed, superactive, mesic Aridic Calciustept	28*
10	B	fine, mixed, superactive, mesic Aridic Haplustepts	
5	U	Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Description

The typifying soil pedon for the A family soil in map unit 11 is soil pedon 28. The surface is grayish brown clay to 8 inches, dark grayish brown (moist). The subsurface (cambic) is gray clay with moderate blocky structure to 24 inches, grayish brown (moist). The upper subsoil (calcic, Bwk) is gray clay with common fine soft calcium carbonate masses to 48 inches, grayish brown (moist). The lower subsoil (calcic, Bk) is light grayish brown clay with common fine and medium soft calcium carbonate masses to 102 inches, grayish brown (moist).

222.400 Present and Potential Productivity of Existing Soils

Soils in the Coal Hollow project area support big sagebrush, grasses (native and introduced species), pinyon pine, Utah juniper, and Gambel oak. Detailed descriptions of the present and potential productivity of the soils are detailed in Chapter 3, Section 321.300.

223. Soil Characterization

This soil survey was made in accordance with the guidelines for an order 2 soil survey as detailed in the Soil Survey manual (USDA 1993). Soils were classified using the Keys to Soil Taxonomy, Ninth Edition (USDA 2003). Respresentative soil samples were submitted for laboratory analysis of the parameters outlined by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (2005).

224. Substitute Topsoil

Based on the 2006-2007 order 2 soil survey, sufficient quantities of suitable topsoil are available for reclamation within the project area. The Coal Hollow Project does not plan to use substitute material for topsoil at the time of reclamation. However, if in the future the Coal Hollow mine plan proposes to use selected overburden materials as a supplement or substitute for topsoil, an application will be provided to the DOGM that includes results of analyses, trials, and tests as described under R645-301-232.100 through R645-301-232.600, R645-301-234, R645-301-242, and R645-301-243. DOGM may also require the results of field-site trials or greenhouse tests as required under R645-301-233.

230. Operation Plan

231. General Requirements

231.100. Methods for Removing and Storing Subsoil and Topsoil

The methods for removing and storing topsoil, subsoil, and other materials will be to first remove the woody plants from the area and place them in piles for later placement in pit backfills. Next, dozers or scrapers will remove the topsoil layer to a depth determined by the soil survey. The topsoil will be stockpiled and protected from wind and water erosion by seeding it with an interim seed mix. Side slopes of stockpiles will be sloped to 3h:1v: The suitable subsoil will then be removed and stockpiled separately from the topsoil. The depth of topsoil and subsoil salvage will be determined by the aforementioned soil survey and in the field during mining by the Coal Hollow environmental technician in consultation with a certified professional soil scientist. Drawing 2-2 shows planned topsoil stockpiles and topsoil removal plans.

231.200. Suitable Substitute Topsoil

The use of substitute topsoil is not planned based on the 2007 soil survey information. Demonstration studies of the suitability of topsoil substitutes or supplements will be submitted to the DOGM if the use of topsoil substitutes become necessary for future reclamation and revegetation.

231.300. Soil Testing for Reclamation

The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil in the same order it existed prior to removal by the mining activities. Next, a basic soil sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil fertilizers and amendments. The parameters analyzed will be:

Electrical conductivity (EC)
Sodium adsorption ratio SAR)

pH
Texture
Organic matter
Available phosphorus (P)
Potassium (K)
Nitrate (NO_3-N)

One composite sample will be collected from approximately every 1 to 4 acres based on soil types and variability.

Pre-testing of the soils has been conducted as part of the soils survey. Results from the pre-testing of topsoil and subsoil can be viewed in Table C-1 of Appendix 2-1.

231.400. <u>Topsoil Handling</u>

A brief narrative that describes the construction, modification, use, and maintenance of topsoil handling and storage areas is given below.

The topsoil will be removed from the mine area and either live hauled to reclamation or stored separately. All soil piles will be seeded with an appropriate interim seed mix to prevent loss and deterioration by wind and water erosion. Soil stockpiles will have side slopes graded to a maximum 3h:1v. Piles will be bermed or otherwise treated to prevent the transport of sediments from the pile. Details about soil horizons and zones planned for use as subsoil are detailed in Appendix 2-1. A detailed map showing stockpile designs/locations and soil removal are shown on Drawing 2-2.

232. <u>Topsoil and Subsoil Removal</u>

232.100. <u>Separate Layers</u>

All soil materials will be removed in separate layers from the area to be disturbed, and segregated.

Based on soil map units, average depths have been estimated and will be used as a guide and monitored in the field. Refer to Table 4-2 in Appendix 2-1.

232.200. <u>Topsoil of Insufficient Quantity or Quality</u>

Where the topsoil is of insufficient quantity or poor quality for sustaining vegetation, other materials approved by the DOGM in accordance with R645-301-233.100 will be removed as a separate layer from the area to be disturbed, and segregated.

Based on the Year 1 Topsoil Survey, there should be sufficient quantities of topsoil to place an average of nine inches of topsoil across all reclaimed areas.

232.300. Shallow Topsoil Handling

If topsoil is less than six inches thick, the operator may remove the topsoil and the unconsolidated materials immediately below the topsoil and treat the mixture as topsoil.

Sufficient quantities of topsoil are estimated to be available for replacement of an average nine inches of topsoil across reclamation, with a minimum of six inches. Therefore, mixing of topsoil with subsoil is not anticipated to be necessary

232.400 - 232.420. Topsoil Removal Exceptions

UDOGM will not require the removal of topsoil for minor disturbances which occur at the site of small structures, such as power poles, signs, or fence lines. Removal of topsoil will not be required when the disturbances will not destroy the existing vegetation and will not cause erosion.

232.500. Subsoil Segregation

The Coal Hollow Project plans to remove soils by their horizons as dictated by the soil survey scheduled for 2006. DOGM may require that the B horizon, C horizon, or other underlying strata, or portions thereof, be removed and segregated, stockpiled, and redistributed as subsoil in accordance with the requirements of R645-301-234 and R645-301-242 if it finds that such subsoil layers are necessary to comply with the revegetation requirements of R645-301-353 through R645-301-357.

Refer to Table 4-2 in Appendix 2-1, which contains estimated subsoil salvage depths. In addition, substitute subsoil has been identified in the layers between the identified topsoil layer and the Tropic Shale. Sufficient quantities of this material are available to live haul most of the subsoil with the exception of one stockpile that will be constructed from the initial mining area. All substitute subsoil materials will be sampled and tested for pH, conductivity, SAR, percent lime, and texture, prior to salvage and stockpiling.

232.600. Timing

All material to be removed under R645-301-232 will be removed after the vegetative cover that would interfere with its salvage is cleared from the area to be disturbed, but before any drilling, blasting, mining, or other surface disturbance takes place. Drawing 2-2 shows the anticipated topsoil removal sequence and stockpiling.

232.700. Topsoil & Subsoil Removal Under Adverse Conditions

An exception to the requirements of R645-301-232 to remove topsoil or subsoils in a separate layer from an area to be disturbed by surface operations may be granted by

UDOGM where the operator can demonstrate;

232.710. Unsafe Conditions

The removal of soils in a separate layer from the area by the use of conventional machines would be unsafe or impractical because of the slope or other conditions of the terrain or because of the rockiness or limited depth of the soils.

These conditions are not anticipated in the Coal Hollow project area.

232.720. Lack of On-Site Material Available

If the requirements of R645-301-233 have been or will be fulfilled with regard to the use of substitute soil materials unless no available substitute material can be made suitable for achieving the revegetation standards of R645-301-356, then the operator will, as a condition of the permit, be required to import soil material of the quality and quantity necessary to achieve such revegetation standards.

Alton Coal Development (ACD) will salvage suitable overburden for use as substitute subsoil material from the zone below the topsoil layer (9 inches thick average) to a maximum depth of 30 feet, excluding any Tropic shale materials. ACD will do additional core hole sampling ahead of the mining operation to identify the zones in which suitable materials occur for maximum salvage potential of substitute subsoil. Representative overburden samples from the core holes will be analyzed for pH, conductivity, SAR, percent lime, and texture.

233.100 - 400 Topsoil Substitutes and Supplements.

Based on the Year 1 Soil Survey contained in Appendix 2-1, topsoil substitutes and supplements are not anticipated to be necessary. This survey estimates that nine inches of topsoil can be replaced across reclamation.

234. Topsoil Storage

234.100. Stockpiles

Materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 will be segregated and stockpiled when it is impractical to redistribute such materials promptly on regraded areas. Drawing 2-2 shows the planned stockpile areas, anticipated storage time, quantities and size.

234.200. Requirements of Stockpiles

Stockpiled materials will be subject to the following conditions.

234.210. (a) They will be selectively placed on a stable site within the permit area. Areas are shown on Drawing 2-2.

234.220. (b) They will be protected from contaminants and unnecessary compaction that would interfere with revegetation.

234.230. (c) They will be protected from wind and water erosion through prompt establishment and maintenance of an effective, quick growing vegetative cover or through other measures approved by the UDOGM. The side slopes will be graded to a maximum 3h:1v. Drawing 2-2 shows the planned stockpile areas, anticipated storage time, quantities and size.

234.240. (d) They will not be moved until required for redistribution unless approved by the UDOGM. Anticipated storage time for each stockpile is shown on Drawing 2-2.

234.300. Long-Term Disturbance & Stockpiling

When long-term disturbed areas will result from facilities and preparation plants and when stockpiling of materials removed under 8645-301-232.100 would be detrimental to the quality or quantity of those materials, DOGM may approve the temporary distribution of the soil materials removed to an approved site within the permit area to enhance the current use of that site until later when needed for reclamation, provided that the following conditions occur.

234.310. Such action will not permanently diminish the capability of the topsoil of the host site.

234.320. The material will be retained in a condition more suitable for redistribution than if stockpiled.

240. Reclamation Plan (General Requirements)

A detailed Order 2 soil survey has been completed in 2006 and 2007 for Year 1 disturbance. This information provides detail for onsite soil suitability, salvage depths, and volumes available for reclamation of the mine site. Dozers or Scrapers will replace the subsoil and topsoil. The topsoil is estimated to average nine inches and the subsoil will be approximately 31 inches in thickness. The total profile of topsoil and subsoil is estimated to average 40 inches. The total soil profile depth will be increased to 48 inches in areas where Tropic shale overburden is within 48 inches of the soil surface.

242. Soil Redistribution

242.100. Topsoil materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 and stored under R645-30I-234 will be redistributed in a manner that meets the following conditions.

242.110. (a) The material achieves an approximately uniform, stable thickness consistent with the approved postmining land use, contours, and surface-water drainage systems. All slopes will be appropriately graded and smoothed prior to placement of topsoil and subsoil layers. Soil layer thicknesses will be regularly checked using a high precision GPS system and spot checking by the ACD environmental technician.

242.120. (b) Material handling prevents excess compaction of the materials. Material handling will be minimized by direct hauling and placing materials when operationally practical rather than stockpiling. Materials will be spread by a dozer or scrapers and spread only as much as necessary to obtain the required uniform thickness. Traffic from rubber tired equipment across topsoil and subsoil will be minimized.

If heavy equipment operation results in soil compaction at the surface of the reclaimed areas, they will then be ripped, disked, and harrowed to loosen the seedbed prior to seeding. In other areas where less compaction has occurred, the areas will be disked and harrowed. The disking and harrowing of all areas will be done parallel with the contour wherever possible to decrease the potential for water erosion downslope. In other areas where compaction is not a problem, dozer tracking can be used to roughen the surface, and to trap seed, fertilizer, mulch, and other amendments as well as decrease erosion by wind and water. In such cases seeding will be done immediately after this treatment, whereas soil amendments, where required, would be applied over the surface during seedbed preparations. Seeding will mainly occur in the spring and fall. Further details about seeding can be reviewed in Chapter 3.

242.130. (c) Handling procedures will be implemented to protect the materials from wind and water erosion before and after seeding and planting. Reclamation will be graded to the planned slope angles, not to exceed 3h:1v. Soil layers will sloped as the material is relocated to the reclaim areas. Once soil is placed, seeding will occur at the earliest appropriate season suitable to planting conditions. Grass matting, mulching and/or cross ditches will be implemented as necessary to control erosion.

242.200. <u>Treatments of Material to be Redistributed</u>

Before redistribution of the materials removed under R645-301-232, the regraded land will be treated if necessary to reduce potential slippage of the redistributed material and to promote root penetration. If no harm will be caused to the redistributed material and reestablished vegetation, such treatment may be conducted after the material is replaced.

Potential for slippage is anticipated to be minimal based on the planned slope angles for reclamation.

242.300. Soil Redistribution on Impoundments & Roads

DOGM may not require the redistribution of topsoil or topsoil substitutes on the approved postmining embankments of permanent impoundments or roads if it determines the following.

242.310. (a) Placement of topsoil or topsoil substitutes on such embankments is inconsistent with the requirement to use the best technology currently available to prevent sedimentation.

242.320. (b) Such embankments will be otherwise stabilized.

243. Soil Nutrients & Amendments

Nutrients and soil amendments will be applied to the redistributed material when necessary to establish the vegetative cover. The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil. Next, a basic soil sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil amendments. The parameters analyzed will be:

- Electrical conductivity (EC)
- Sodium adsorption ratio (SAR)
- pH
- Texture
- Organic matter
- Available phosphorus (P)
- Soluble Potassium (K)
- Nitrate-Nitrogen

One composite sample will be collected from approximately every 1 to 4 acres based on soil types and variability. Each composite will be comprised of at least 4 su-samples.

Pre-testing of the soils has been conducted as part of the soils survey. Results from the pre-testing of topsoil and subsoil can be viewed in Table C-1 of Appendix 2-1 (native topsoil and subsoil) and Table C-2 (samples from core hole/overburden pits) of Appendix 2-1.

244. Soil Stabilization

244.100. Erosion Protection from Wind & Water

All exposed surface areas will be protected and stabilized to effectively control erosion and air pollution attendant to erosion. Reclamation will be regraded to the planned slope angles, not to exceed 3h:1v. Soil layers will sloped as the material is relocated to the reclaim areas. Once soil is placed, seeding will occur at the earliest appropriate season suitable to planting conditions. Grass matting, mulching and/or cross ditches will be implemented as necessary to control erosion.

244.200. Mulch

Suitable mulch and other soil stabilizing practices will be used on all areas that have been regraded and covered by topsoil or topsoil substitutes. DOGM may waive this requirement if seasonal, soil, or slope factors result in a condition where mulch and other soil stabilizing practices are not necessary to control erosion and to promptly establish an effective vegetative cover.

Mulch will be placed on the seedbed surface once soil amendments have been incorporated and seeding has been accomplished in areas that will be reclaimed to native plant communities (areas used for pasture lands will not be mulched). The mulch should control erosion by wind and water, decrease evaporation and seed predation, and increase survivability of the seeded species. Like the seeding methods, mulch will be applied with a variety of techniques and materials depending on the reclaimed area.

244.300. Rills & Gullies

Rills and gullies that form in areas that have been regraded and topsoiled that cause the following conditions will have the topsoil replaced followed by reseeding or replanting if the following occurs.

244.310. (a) If they disrupt the approved postmining land use or the reestablishment of the vegetative cover.

244.320. (b) If they cause or contribute to a violation of water quality standards for receiving streams will be filled, regraded, or otherwise stabilized.

250. PERFORMANCE STANDARDS

251. Topsoil & Subsoil Removed

All topsoil, subsoil and topsoil substitutes or supplements will be removed, maintained and redistributed according to the plan given under R645-301-230 and R645-301-240.

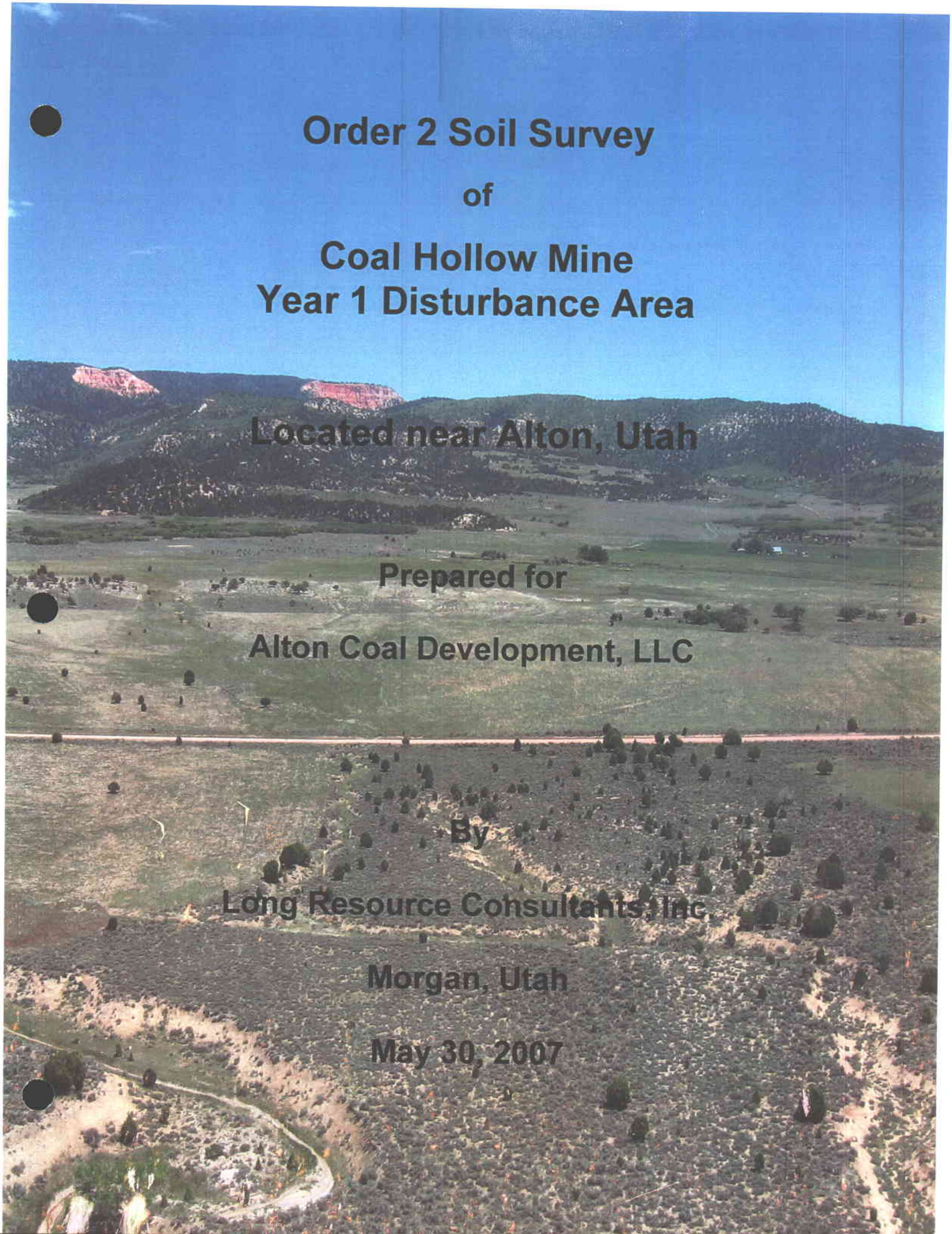
252.Topsoil & Subsoil Stockpiled

All stockpiled topsoil, subsoil and topsoil substitutes or supplements will be located, maintained and redistributed according to plans given under R645-301-230 and R645-301-240.

APPENDIX 2-1

Order 2 Soil Survey
Of
Coal Hollow Mine, Year 1 Disturbance

By: Long Resource Consultants, Inc.



Order 2 Soil Survey

of

Coal Hollow Mine
Year 1 Disturbance Area

Located near Alton, Utah

Prepared for

Alton Coal Development, LLC

By

Long Resource Consultants, Inc.

Morgan, Utah

May 30, 2007

Order 2 Soil Survey

of

Coal Hollow Mine
Year 1 Disturbance Area

Located near Alton, Utah

Prepared for

Alton Coal Development, LLC

By

Long Resource Consultants, Inc.

Morgan, Utah

May 30, 2007

Coal Hollow Project Soil Survey

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Purpose of Soil Survey

The purpose of this report is to summarize the results of an order 2 soils inventory conducted for Alton Coal Development, LLC (ACD) in an area proposed for development of a surface coal mine, Coal Hollow Project, in Kane County, approximately 2.5 miles south southeast of Alton, Utah. The survey area is on private lands owned or leased by ACD. This phase of the soil survey was confined to areas proposed to be disturbed during year one of the ACD mine plan. This soil survey was prepared so that ACD could: 1) identify suitable sources of subsoil and topsoil; 2) determine topsoil and subsoil salvage depths and quantities; and, 3) develop a post mining reclamation plan using salvaged soil materials. This soil survey covers 230 acres.

Project Area

The Coal Hollow Project soil survey area is located in the Sink Valley portion of the Alton Amphitheater, figures 1-1 and 1-2. It is bounded on the northeast and east by the Paunsaugunt Plateau and by the Markagunt Plateau on the northwest. Black Mountain separates Sink Valley from Long Valley on the west. It is bounded on the south by the Skutumpah Terrace The project area includes portions of the southwest quarter of section 19, southeast quarter of section 20, west quarter of section 29, and east quarter of section 30 in Township 39 south, Range 5 west, Salt Lake Base meridian. Elevation ranges from approximately 6,840 to 7,100 feet.

The ADC soil survey area is drained by Lower Robinson Creek and Sink Valley Wash which flow into Kanab Creek (iGage, 1999).

Native vegetation in the ADC soil survey area consists of Utah juniper, pinyon pine, big sagebrush, and wet meadows. Portions of the project area were previously cleared of Utah juniper, pinyon pine, and sagebrush and planted to non-irrigated grass pasture.

Climate

An official U.S. Weather Bureau station is located in Alton, Utah. The period of available records for this station is January 1, 1928 through October 31, 2006 (Western Regional Climate Center, April 2007). Average annual precipitation is 16.43 inches and is evenly distributed throughout the year. The average annual air temperature is 45.7 °F. The precipitation pattern is ustic and soil temperature regime is mesic (C. Meir, 2006) bordering on frigid. Table 1-1 contains a summary of weather data for Alton, Utah. Summers are warm with cool nights.

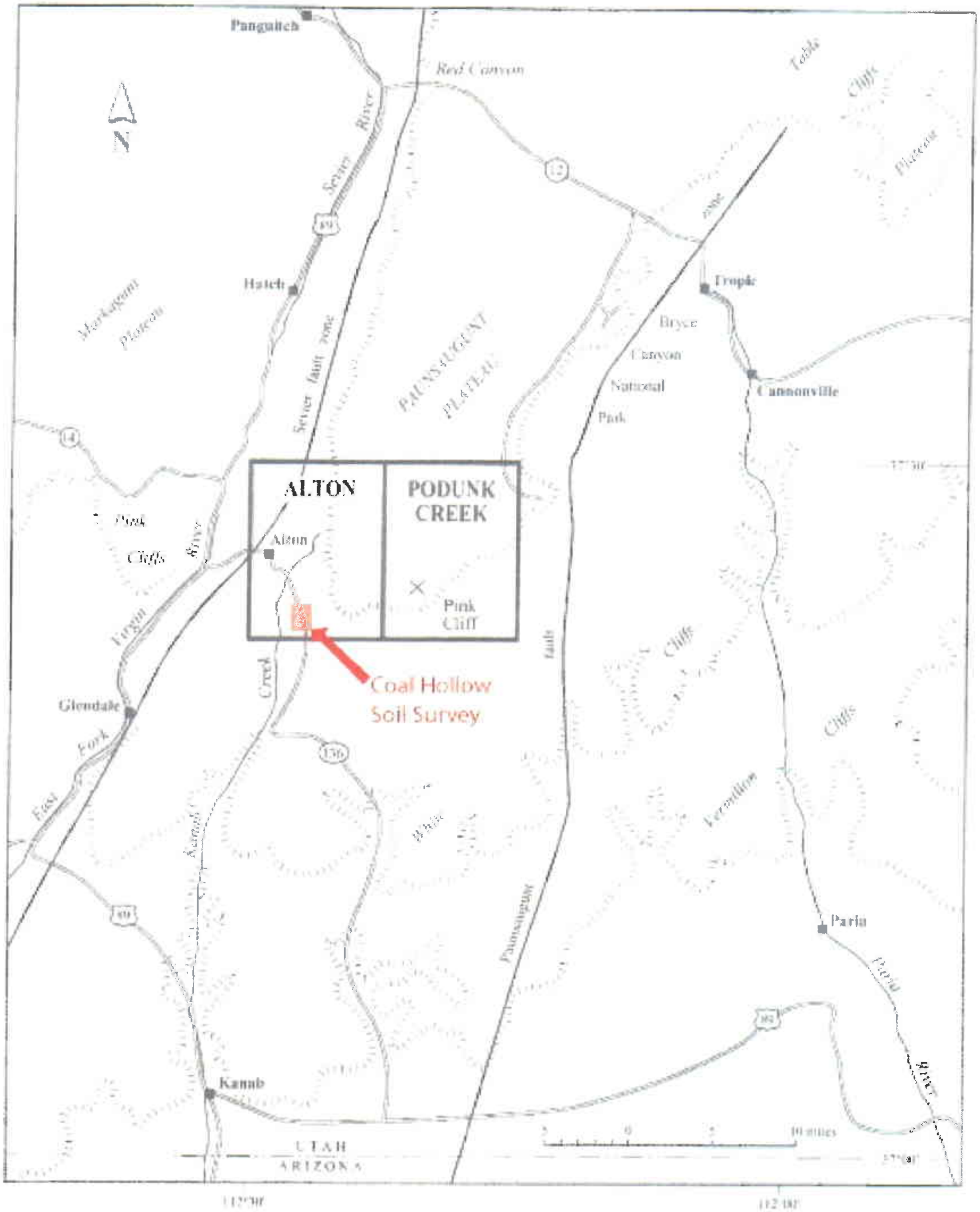


Figure 1. Index map of the Paunsaugunt Plateau region, showing the Alton and Podunk Creek quadrangles. The highest point (Pink Cliff) and only settlement in the study area (Alton) are indicated. The quadrangles were mapped together. The map is adapted from Gregory (1951, p. 3).

Figure 1-1. General location of Coal Hollow Soil Survey area. Location and shape are approximate. Base map is index map of Paunsaugunt Plateau region (Utah Geological Survey, 2001).

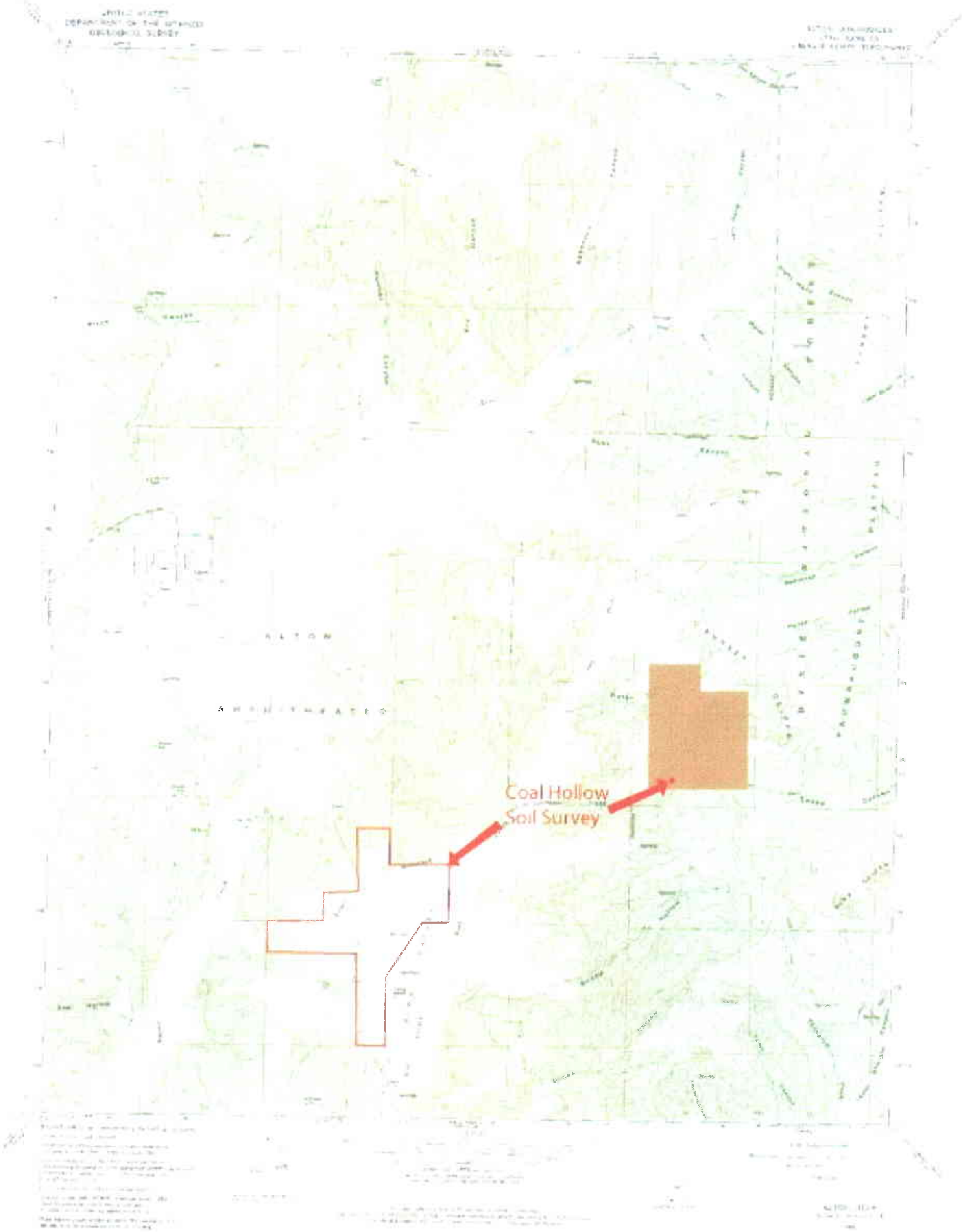


Figure 1-2. Location of Coal Hollow Soil Survey area south of Alton, Utah. Location is approximate. Base map is Alton, Utah quadrangle (iGage, 1999).

Table 1-1. Summary of weather data for Alton, Utah.

	Ave Max Temp (F)	Ave Min Temp (F)	Ave Total Precip (in)	Ave. Total Snowfall (in)	Ave Total Snow Depth (in)
January	39.6	15.1	1.79	21.1	6
February	42.2	17.5	1.79	19.2	8
March	47.8	21.8	1.57	14.5	5
April	57.7	28.0	1.05	4.4	1
May	67.3	34.8	0.84	0.6	0
June	76.8	42.0	0.56	0.1	0
July	82.7	49.8	1.42	0.0	0
August	80.4	48.9	1.74	0.0	0
September	73.9	41.8	1.49	0.0	0
October	63.0	33.0	1.43	1.3	0
November	49.9	23.0	1.23	6.6	1
December	41.8	16.8	1.52	15.4	2
Annual	60.3	31.0	16.43	83.3	2
Source: Western Regional Climate Center, April 2007.					

How the Soil Survey was Made

This soil survey was made in accordance with the guidelines for an order II soil survey as detailed in the Soil Survey manual (USDA 1993). Soils were classified using the Keys to Soil Taxonomy, Ninth Edition (USDA 2003). The dominant soil sub-groups identified in the Coal Hollow soil survey area are Aridic Calciustepts, Aridic Calciustolls, Calcidic Haplustalfs, Aeric Epiaquepts, and Aridic Ustorthents. Tables of the taxonomic classification of the soil profiles are contained in appendix B.

Field Evaluation of Soils

Soil pedon descriptions were completed for representative backhoe pits dug in September and November 2006 and in March and April 2007. Pits in very deep soils were dug to a minimum 60 inches unless bedrock or wet soil conditions were limiting. But most soil pits were dug and described to 84 inches or deeper. Two soil pits in soils less than 20 inches were hand dug. Soil pedon log sheets were completed for each soil pit using the methods detailed in the *Field Book for Describing and Sampling Soils*, version 2 (Schoeneberger et. al., 2002). Soil pits 1 through 42 were described by Bruce Chesler, soil scientist (B. Chesler, 2007). Soil pits 43 through 50 were described by Robert Long, Certified Professional Soil Scientist.

Aerial photographs (1:15,000 and 1:7,200) were used to delineate soil map unit boundaries based on slope gradient, geomorphic features, and vegetation. The aerial photography was taken in July 2006 by Olympus Aerial Surveys, Inc., Salt Lake City, Utah. A mirror stereoscope was used to view paired photo images.

Samples of soil horizons were collected in gallon size plastic bags and in micro-monolith boxes. The box samples were used for further determination of soil profile characteristics.

Analysis of Soil Samples

Soil samples (145) from 27 representative soil profiles that were collected during September 12-19, 2006 were shipped on September 25 and October 2, 2006 to Inter-mountain Laboratories in Sheridan, Wyoming for chemical and physical analysis. Each of the soil samples were analyzed for the parameters outlined by the Utah Division of Oil Gas and Mining's (DOGM) *Guidelines for Management of Topsoil and Overburden* (DOGM, 2005), Table 1-2.

Soil samples (32) collected during November 2006 and March 2007 from 8 representative soil profiles were shipped to Energy Labs in Casper, Wyoming for analysis of the topsoil suitability parameters listed in table 1-2 on March 29, 2007.

Five soil samples collected from two shallow soil pits were shipped to Energy Labs in Casper, Wyoming for analysis of the topsoil suitability parameters listed in table 1-2 on April 11, 2007.

Table 1-2. Soil analysis parameters for topsoil and overburden (Utah DOGM, 2005).

Topsoil Suitability Parameters	
Paste pH	Available Phosphorus
Saturation percent	Particle Size Analysis (% very fine sand, sand, silt, and clay)
Electrical Conductivity (ECe)	Organic Matter Percent
Soluble Na, K, Mg, and Ca	CaCo3 Percent
Sodium Adsorption Ratio	Extractable Potassium
Additional Analyses for Topsoil and Overburden	
Soluble Selenium	Soluble Boron
Alkalinity	

Laboratory data reports of the soil sample analyses are in Appendix B.

Geology and Setting

The Coal Hollow soil survey area is located in Sink Valley in the western part of the Alton Amphitheater southwest of the Paunsaugunt Plateau. Quaternary alluvium (Qa), Tropic shale (Kt), Dakota sandstone (Kd), and the Tibbet Canyon sandstone (Kst) member of the Straight Cliffs Formation are the primary sources of parent material in the soil survey area. Figure 1-3 illustrates geologic formations and features in the soil survey area (Utah Geological Survey, 2001). The Sink Valley fault runs north south through the Coal Hollow Soil Survey area (Utah Geological Survey, 2001).

Quaternary alluvium (Qa) consists of unconsolidated clay, silt, sand, and gravel deposits located in fan alluvium and terrace deposits of Holocene age (Utah Geological Survey, 2001). The primary sources of the Quaternary alluvium is the Tropic shale (Kt), Smoky Hollow sandstone member of the Straight Cliffs formation, John Henry sandstone member of the Straight Cliffs formation, and the Drip Tank sandstone member of the Straight Cliffs formation (Utah Geological Survey, 2001). Soils developed from Quaternary alluvium are situated on a large alluvial fan that flowed out of the Robinson Creek drainage and unnamed smaller drainages and across the Sink Valley fault.

Tropic shale (Kt) is a member of the Upper Cretataceous formation and is also referred to as Moncos shale (Hintze, 1977). It is a medium-brownish-gray to medium dark-gray, very thin-bedded, silty shale. Soils developed from Tropic shale are primarily east of the Sink Valley fault (Utah Geological Survey, 2001). Seeps on top of the Tropic shale have resulted in the development of aquic soils. Shallow soils have developed in Tropic shale along the Sink Valley fault escarpment.

Dakota sandstone (Kd) consists of interbeded yellowish-gray and brown sandstone, gray mudstone, black carbonaceous mudstone and coal, and some bentonite (Utah Geological Survey, 2001). Shallow and moderately deep soils have developed in Dakota sandstone at the east ends of the soil survey area where it is intermingled with Tropic shale.

Tibbet Canyon sandstone (Kst) consists of orangish-gray-weathering sandstone that intermingles with the underlying Tropic shale (Utah Geological Survey, 2001). Shallow and moderately deep soils have developed in Tibbet Canyon sandstone at the north end of the soil survey area.

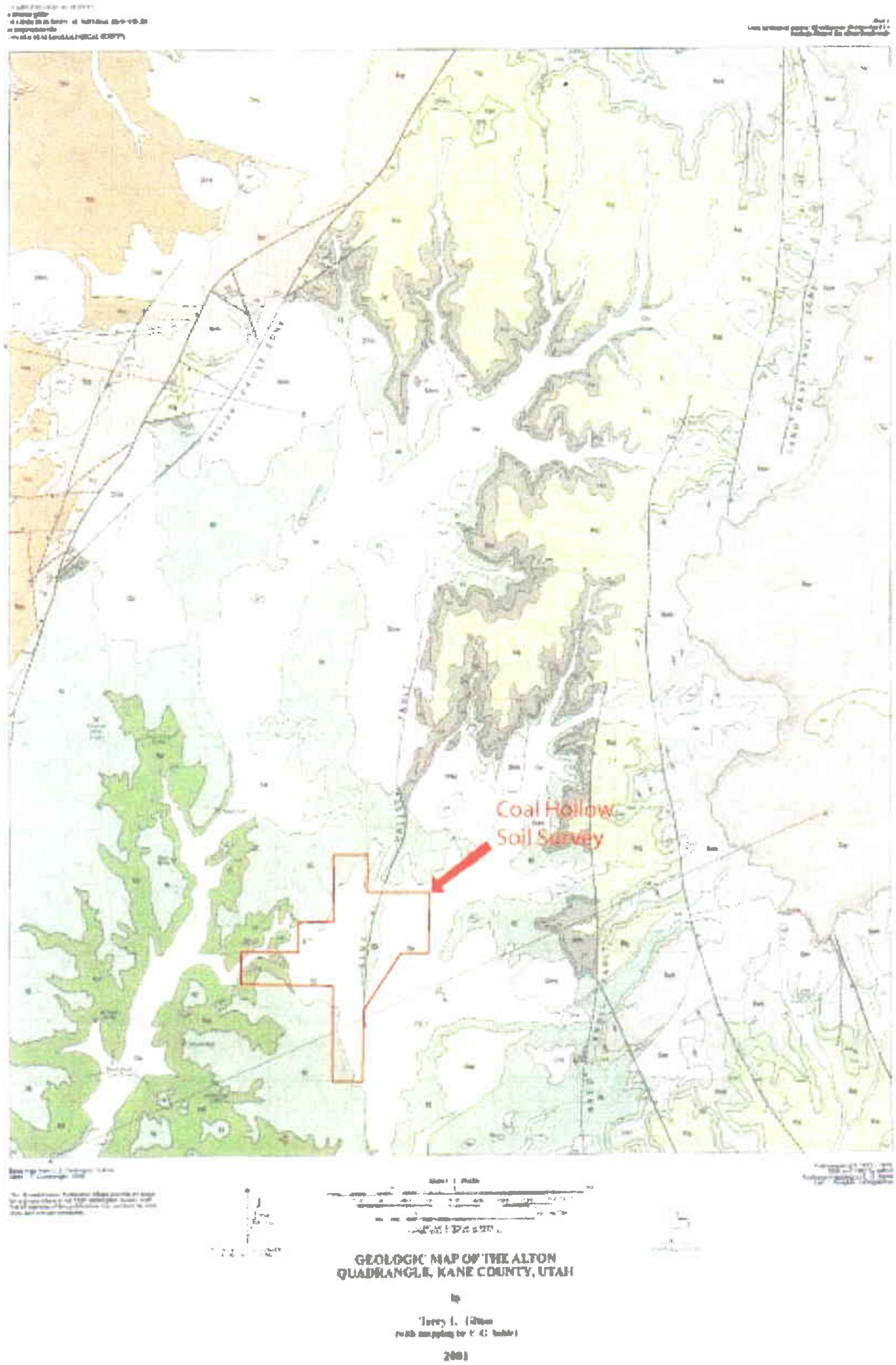


Figure 1-3. Alton quadrangle geological map showing location of Coal Hollow Soil Survey (Utah Geological Survey, 2001).

Prime Farmland

The Natural Resource Conservation Service conducted a prime farmland assessment in October 2006 and determined that "No Prime Farmland or Soils of Statewide Importance were found within the study area (Coal Hollow Mine area), per criteria outlined in the National Survey Handbook Part 622 and Exhibit UT603-1, respectively (C. Meier, 2006)." The assessment stated that the soils "..could classify as Soils of Statewide Importance, if irrigated."

"An available and reliable source of moisture to sustain crops common to the area is the primary limiting factor that excludes the observed soils from classifying as Prime Farmland or SSI (C. Meier, 2006)."

"In addition to a lack of a reliable source of water, soils did not classify as Prime Farmland due to high pH, high electrical conductivity, excessive erosion potential on steep slopes and slow permeability (C. Meier, 2006)."

Soil Survey Legend

Sols in the Coal Hollow project soil survey area have been grouped into eleven soil map units based on taxonomic classification, depth to parent material, and slope. The composition of these map units is described in table 2-1. Detailed descriptions of each soil map unit are included in this section. The Coal Hollow soil survey map is Drawing 2-1.

Table 2-1. Soil map unit composition for the Coal Hollow project year 1 area.

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
1			**A - J families complex, 3 to 8 percent slopes**	
	65	A	fine, mixed, superactive, mesic Aridic Calciustept	1
	15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
	10	D	fine, mixed, superactive, mesic Aridic Calciustoll	33
	5	S	fine, mixed, superactive, mesic Aridic Haplustalf	48
	5	M	fine, mixed, superactive, mesic Aridic Haplustepts	
2			**M - B - D families complex, 3 to 8 percent slopes**	
	60	M	fine, mixed, superactive, mesic Aridic Calciustepts	3
	25	B	fine, mixed, superactive, mesic Aridic Haplustepts	4
	15	D	fine, mixed, superactive, mesic Aridic Calciustoll	2
3			**E - J families complex, 3 to 8 percent slopes**	
	60	E	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6
	30	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
	5	A	fine, mixed, superactive, mesic Aridic Calciustept	
	5	B	fine, mixed, superactive, mesic Aridic Haplustepts	
4			**C - H - J families complex, 3 to 8 percent slopes**	
	50	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17
	25	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39
	15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19
	5	D	fine, mixed, superactive, mesic Aridic Calciustoll	
	5	A	fine, mixed, superactive, mesic Aridic Calciustept	
5			**B - M - T families complex, 8 to 25 percent slopes**	
	40	B	fine, mixed, superactive, mesic Aridic Haplustepts	24
	30	M	fine, mixed, superactive, mesic Aridic Calciustept	25
	20	T	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49
	10	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
6			**F - G - C families complex, 1 to 5 percent slopes**	
	45	F	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	9A
	20	G	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B
	20	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16
	15	I	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14
7			**O - R families complex, 1 to 5 percent slopes**	
	55	O	fine, mixed, superactive frigid Aeric Epiaquept	38
	20	R	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A
	10	Q	fine, mixed, superactive, frigid Typic Argiaquoll	43
	10	P	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40
	3	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
	2	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
8			**L - H - K families complex, 3 to 8 percent slopes**	
	40	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22
	30	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20
	20	K	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21
	10	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
9			**D - W families complex, 5 to 30 percent slopes**	
	55	D	fine, mixed, superactive, mesic Aridic Calciustoll	41
	30	W	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42
	10	A	fine, mixed, superactive, mesic Aridic Calciustept	
	5		Creek bottom	
10			**U family, 8 to 25 percent slopes**	
	85	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	50
	10	T	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	
	5	B	fine, mixed, superactive, mesic Aridic Haplustepts	
11			**A family, 8 to 25 percent slopes**	
	85	A	fine, mixed, superactive, mesic Aridic Calciustept	28
	10	B	fine, mixed, superactive, mesic Aridic Haplustepts	
	5	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	

1	Soil families were given letter designations, because it was not possible to correlate the soils to established soil series since no NRCS published or SSURGO certified soil survey data exists in or adjacent to the Coal Hollow project area. Assignment of soil type letters enables comparison of map units and simplifies map unit names.
2	Soil families classified using Keys to Soil Taxonomy, Ninth Edition (NRCS 2003).
3	Soil pedon described within map unit boundaries that represents the characteristics of the soil family within the soil map unit.

1 A - J families complex, 3 to 8 percent slopes

General Description

Map unit 1 is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997). The depth to Tropic shale is greater than 40 inches in the major soils (A and J), but minor inclusions with Tropic shale from 20 to 40 inches deep occur. The map unit is dominated by big sagebrush and grasses.

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities and establish topsoil and subsoil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
65	A	fine, mixed, superactive, mesic Aridic Calciustept	1*
15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
10	D	fine, mixed, superactive, mesic Aridic Calciustoll	33
5	S	fine, mixed, superactive, mesic Aridic Haplustalf	48*
5	M	fine, mixed, superactive, mesic Aridic Haplustepts	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

Soil colors are for dry soil unless specified otherwise.

The typifying soil pedon for A family soils in map unit 1 is soil pedon 27. The surface is a grayish brown clay loam 12 inches thick, dark grayish brown (moist). The subsoil (calcic) consists of light brownish gray silty clay, light olive brown (moist). Decomposing Tropic shale occurs at 42 inches below the surface.

The typifying soil pedon for the J family soils in map unit 1 is soil pedon 32. The mollic surface is a brown loam 8 inches thick, very dark grayish brown (moist). The subsurface (argillic) is a pale brown clay loam and silty clay, brown (moist). The subsoil (calcic) is pink loam to 6 feet, brown (moist). The underlying soil to nearly 12 feet is light yellowish brown silty clay over pink coarse sands with 10 percent faint strong brown mottles.

Supporting Soil Pedons

Soil family A is also represented by soil pits 27 and 30 in map unit A. Soil pit 27 does not have Tropic shale within 140 inches of the surface. Soil pit 30 has decomposing Tropic shale at 105 inches below the surface.

Laboratory Analysis

Analysis of soil samples from soil pit 1 had a poor soil pH (8.7) from 24 to 42 inches and fair lime percents (22.6 to 28.3 percent) throughout the soil profile. The silty clay texture at 24 inches is in the poor category for texture. SAR increases gradually with depth to 4.02 in the 24 to 42 inch horizon and then reaches 12.3 in the tropic shale below 42 inches.

Soil Inclusions

Small inclusions of D, S, and M soils occur within map unit 1. D soils are similar to the A soils, but have a mollic epipedon (dark surface). The S soils are similar to the J soils, but do not have a calcic horizon within 40 inches of the soil surface. The M soils are moderately deep to Tropic shale and are located along the map unit boundary with map unit 2.

2 M - B - D families complex, 3 to 8 percent slopes

General Description

This map unit is dominated by soils with Tropic shale parent material at 20 to 72 inches below the surface. The map unit is dominated by big sagebrush and grasses with some pinyon pine and Utah juniper encroaching along edges of the map unit near map unit 5. This map unit is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997).

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities. A second small delineation of map unit 2 occurs along the south boundary of the proposed year 1 mining area west of the county road.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	M	fine, mixed, superactive, mesic Aridic Calciustepts	3*
25	B	fine, mixed, superactive, mesic Aridic Haplustepts	4*
15	D	fine, mixed, superactive, mesic Aridic Calciustoll	2*
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for M family soils in map unit 2 is soil pedon 3. The surface is a brown loam 4 inches thick, dark brown (moist). The subsurface (cambic) is a grayish brown clay loam and silty clay loam 15 inches thick, brown (moist). The underlying subsoil to 33 inches is light brownish gray silty clay, light olive brown (moist). Tropic shale parent material occurs at 33 inches below the surface.

The typifying soil pedon for B family soils in map unit 2 is pedon 4. The surface is pale brown silty clay 4 inches thick, dark grayish brown (moist). The subsurface (cambic) is light brownish gray silty clay moderate to strong structure, dark grayish brown (moist) to 31 inches. Tropic shale parent material occurs at 31 inches.

The typifying soil pedon for D family soils in map unit 2 is pedon 2. The surface (mollic) is brown clay loam 12 inches thick, very dark grayish brown (moist). The subsurface (cambic and calcic) is pale brown silty clay and clay to 48 inches deep, brown (moist). The subsoil is white silty clay to 72 inches, brown (moist). Tropic shale parent material occurs at 72 inches below the surface.

Supporting Soil Pedons

Soil pedon 12 is representative of soil type M and is located in the delineation of map unit 2 along the south boundary of the year 1 mining area. The depth to Tropic shale in pedon 12 is 26 inches.

Laboratory Analysis

The main limiting feature of soils in map unit 2 is an increase of conductivity and SAR into the fair range as the soil depth reaches the interface with Tropic shale. The percent lime in the soil ranges from 18.6 to 27.5 above the Tropic shale. The saturation percentage increases with the percent clay, but remains in the fair range even with the clay and silty clay.

3 E - J families complex, 3 to 8 percent slopes

General Description

Map unit 3 is characterized by very deep soils that show some indication of alluvial deposition most likely from the large alluvial fan that formed this portion of Sink Valley. Recent soil deposition from nearby Robinson Creek is indicated in pedon 6 by an increase of organic matter at 12 inches below the soil surface.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	E	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6*
30	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
5	A	fine, mixed, superactive, mesic Aridic Calciustept	
5	B	fine, mixed, superactive, mesic Aridic Haplustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for E family soils in map unit 3 is soil pedon 6. The surface is brown loamy sand 12 inches thick, dark yellowish brown (moist). The subsoil (calcic) is pale brown loam and sandy loam to 34 inches deep, brown (moist). The underlying soil to 60 inches is light grayish brown silty clay, brown (moist).

The typifying soil pedon for J family in map unit 3 is soil pedon 31. The surface (mollic) is dark grayish brown loam 7 inches thick, dark brown (moist). The subsurface (argillic) is light yellowish brown clay loam to 17 inches, dark yellowish brown (moist). The subsoil (lower argillic and calcic) is light brownish gray and brown clay loam and loam to 52 inches, grayish brown and brown (moist). The underlying soil to 110 inches is very pale brown sandy loam and loamy sand, brown and yellowish brown (moist).

Supporting Soil Pedons

Soil pedon 13 is representative of soil family E in map unit 3.

Laboratory Analysis

Soil pH increases to the fair category (8.3 to 8.5) at 6 inches below the surface in pedon 6. The soil pH is consistent with percent lime in fair category (18.4 to 29.2). The loamy sand surface has a fair water holding capacity. Organic matter has an irregular increase at 12 inches from 0.7 in the A2 horizon to 2.6 in the upper Bk horizon.

Soil Inclusions

Small inclusions of A and B soil families occur in map unit 3. A soils are similar to E soils, but have a higher percentage of clay in the control section (10 to 40 inches). B soils are very deep but do not have either an argillic horizon (increase in illuvial clays) or a calcic horizon within 40 inches of the soil surface.

4 C - H - J families complex, 3 to 8 percent slopes

General Description

Map unit 4 is characterized by very deep fine-loamy and coarse-loamy soils with mollic epipedons and calcic horizons. Lime accumulations below 12 to 22 inches are common in these soils. Soil pH is strongly alkaline below 22 inches in some soils. Vegetation in this map unit is big sagebrush and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
50	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17*
25	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39*
15	J	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19*
5	D	fine, mixed, superactive, mesic Aridic Calciustoll	7*
5	A	fine, mixed, superactive, mesic Aridic Calciustept	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for C family in map unit 4 is soil pedon 17. The surface (mollic) is a brown clay loam 9 inches thick, dark brown (moist). The subsurface (cambic) is a pale brown clay loam to 18 inches, brown (moist). The lower subsurface (Bwk) to 45 inches is light yellowish brown loam and clay loam, dark yellowish brown (moist). The underlying subsoil (calcic) is very pale brown clay loam and silty clay to 80 inches, yellowish brown (moist).

The typifying soil pedon for H family in map unit 4 is soil pedon 39. The surface is brown clay loam 12 inches thick, dark brown (moist). The subsurface (calcic) is a very pale brown to light yellowish brown sandy loam to 36 inches deep, yellowish brown (moist). The underlying subsoil is a very pale brown very cobbly loamy sand to 75 inches, brown (moist).

The typifying soil pedon for J family in map unit 4 is soil pedon 19. The surface (mollic) is a grayish brown loam 6 inches thick, very dark grayish brown (moist). The subsurface (upper argillic) is a brown and pale brown clay loam to 24 inches deep, dark grayish brown and yellowish brown (moist). The lower subsurface (lower argillic and upper calcic, Btk) is a pale brown loam to 37 inches deep, brown (moist). The underlying subsoil (calcic) is a pale brown and light yellowish brown sandy loam to 90 inches deep, yellowish brown (moist).

Supporting Soil Pedons

Soil family C is represented by soil pedons 5, 8, 10, 18B, 23, 34, and 35. Soil family H is represented by soil pedons 11, 36, and 37.

Laboratory Analysis

Soil type C is characterized by soil pH in the poor range of 8.6 to 9.0 (Utah DOGM, 2005) at depths below 22 to 40 inches. This strongly alkaline soil pH corresponds to lime percentages of greater than 30 in this same portion of the soil profile.

Soil type H is dominated by sandy loam and loamy sand textures with some clay loam. Lime accumulation occurs below 12 to 16 inches, but percentages are lower relative to the fine-loamy type C soils. Soil pH becomes strongly alkaline at depths of 48 inches in some pedons.

Soil type J has fair levels of carbonates throughout the soil profile. Soil pH was measured as poor below 68" in soil pedon 19.

Soil Inclusions

Soil family D is represented by pedon 7 in map unit 4. There are also small inclusions of soil family A where map unit 4 borders map units 1 and 11.

5 B - M - T families complex, 8 to 25 percent slopes

General Description

These soils are moderately deep (20 to 40 inches) to shallow (less than 20 inches to Tropic shale. The moderately deep soils have clayey textures, while the shallow soils are loamy. Vegetation is pinyon pine, Utah juniper, black sage and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
40	B	fine, mixed, superactive, mesic Aridic Haplustepts	24*
30	M	fine, mixed, superactive, mesic Aridic Calciustept	25*
20	T	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49*
10	U	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for B family in map unit 5 is soil pedon 24. The surface is olive brown clay 5 inches thick, dark grayish brown (moist). The subsurface (cambic) is dark grayish brown and olive clay with moderate to strong blocky structure to 32 inches. Tropic shale parent material is at 32 inches.

The typifying soil pedon for M family in map unit 5 is soil pedon 25. The surface is covered with a half inch of decomposing needles and twigs. The soil surface is light brown clay 5 inches thick, brown (moist). The subsurface (calcic) is brown and strong brown clay with lime accumulations, dark brown (moist). Tropic shale parent material is at 32 inches.

The typifying soil pedon for T family in map unit 5 is soil pedon 49. The surface light yellowish brown silty clay loam 3 inches thick, light olive brown (moist). The subsoil is a light olive brown loam to 10 inches, olive brown (moist). Interbeded sandstone and Tropic shale are at 10 inches.

Laboratory Analysis

Soil type B is characterized by percent clay of 44 to 47 with correspondingly high saturation percentages of 73.6 to 91.2. Conductivity increases to 7.8 at 17 inches below the surface.

Soil type M is characterized by percent clay of 40 to 47 with correspondingly high saturation percentages of 58.5 to 80.6 in the upper 20 inches of the soil profile.

The percent clay decreases to 33 percent below 20 inches. Lime percentage is greater than 30 in the 5 to 20 inch depth, but less than 5 above and below this zone.

Soil type T is characterized by pH of 8.1 to 8.4, lime percentage of 18, and SAR of less than 0.1.

Soil Inclusions

There are some inclusions of U family soil that is shallow (less than 20 inches) to Tropic shale. The U soils are clayey.

6 F - G - C families complex, 1 to 5 percent slopes

General Description

These medium to coarse textured soils are very deep. Wet soil conditions are present at varying depths in all of the map unit soils. The depth to wet soil conditions varies from 14 to 58 inches. This map unit is not a good source of subsoil. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is grasses, sedges, and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	F	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15*
20	G	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B*
20	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16*
15	I	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14*
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for F family in map unit 6 is soil pedon 15. There is a dense root mat 1 inch thick on the surface. The surface is brown sandy loam 8 inches thick, dark brown (moist). The subsurface (cambic) is pale brown loam with moderate structure, dark yellowish brown (moist). The subsoil (calcic) is very pale brown loam to 58 inches deep, yellowish brown (moist). The underlying soil is yellow and brownish yellow sandy loam with common prominent mottles to 96 inches, yellowish brown (moist).

The typifying soil pedon for G family in map unit 6 is soil pedon 9B. The surface is dark grayish brown loam 6 inches thick, very dark grayish brown (moist). The lower surface is grayish brown sandy clay loam to 14 inches with few faint mottles, dark grayish brown (moist). The subsurface is light brownish gray sandy loam with common prominent mottles, dark gray (moist). The subsoil is light gray sandy loam with many prominent mottles, grayish brown (moist). The soil was wet below 48 inches.

The typifying soil pedon for C family in map unit 6 is soil pedon 16. There is a dense root mat 1 ½ inch thick on the surface. The surface is dark grayish brown silty clay loam 8 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 18 inches, strong brown (moist). The subsoil is pink clay loam to 36 inches, brown (moist). The lower subsoil is pink silty clay loam and loam with few faint strong brown mottles to 68 inches, brown (moist). The underlying soil is light brownish gray clay loam with common prominent yellowish red mottles, grayish brown (moist).

Supporting Soil Pedons

Soil pedon 9A is similar to soil family F, but it has carbonates throughout the soil profile without any zone of accumulation.

Laboratory Analysis

Strongly alkaline soil pH (8.6 to 9.0) within 12 to 20 inches of the soil surface is the main limiting feature of the soils in map unit 6. Soil pedon 9A has very strongly alkaline pH (greater than 9.0) below 12 inches of the surface.

Lime percentage exceeds 30 in 3 of 5 pedons within 12 to 20 inches of the surface. Lime percentage ranges from 15 to 26 in the other two pedons from the surface to 48 inches.

Soil Inclusions

Soil pedon 14 is representative of minor soils within map unit 6 that do not have a mollic epipedon (dark surface) and have aquic (wet) soil conditions within 30 inches of the surface. These soils have a calcic horizon.

7 O - R families complex, 1 to 5 percent slopes

General Description

This soil map unit is located on an alluvial terrace that is underlain by Tropic shale. It is located on the east side of the Sink Valley fault. Soils are characterized by clay and a high water table that is perched on top of the heavy clay soils. The high water table is at or within a foot of the soil surface during the wet period of the year. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is sedges and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	O	fine, mixed, superactive frigid Aeric Epiaquept	38*
20	R	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A*
10	Q	fine, mixed, superactive, frigid Typic Argiaquoll	43
10	P	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40*
3	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
2	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for O family soils in map unit 7 is soil pedon 38. The surface is dark grayish brown (moist) silty clay 6 inches thick. The subsurface is a yellowish brown (moist) silty clay 6 inches thick. The calcic horizon begins at 12 inches below the surface and is a light yellowish brown (moist) to very pale brown (moist) silty clay. The calcic horizon continues to 48 inches or deeper. The water table was at 29 inches when the pit was described in March 2007. Mottles and gleyed soil were observed below 12 inches. Vegetation is grasses, sedges, widely scattered Wyoming big sagebrush, and wild rose.

The typifying soil pedon for R family in map unit 7 is soil pedon 18A. The mollic surface is a very dark grayish brown (moist) loam to 7 inches. The cambic horizon is a brown (moist) loam to 15 inches deep. The calcic horizon is a light olive brown (moist) sandy loam to 30 inches. The underlying soil is grayish brown (moist) clay loam and sandy clay loam to 60 inches deep. Mottles were observed below 7 inches. The water table was at 51 inches when the described in September 2006.

Supporting Soil Pedons

O family soil type was observed in pedon 45 within map unit 7 and a similar clayey soil in pedon 44. The R soil family was observed was also observed in pit 46.

Laboratory Analysis

The O family soil is characterized by silty clay from the surface down to 24 inches or greater. Soil pH is 8.3 to 8.5 in the 12 to 24" horizon. Saturation percentage ranges from 69.9 to 81.8 in the upper 24 inches. The calcium carbonate equivalent ranges from 17.8 to 28.3 in the upper 20 inches and then increases to 44.5 below 20 inches. This soil pit was not sampled below 24 inches, because of the high water table.

The R family soil is characterized by medium textured soils (loam, clay loam, and sandy clay loam in the upper 60 inches. The calcium carbonate equivalent ranges increases from 20.2 percent in the upper 7 inches to 29.3 percent in the 30 to 45 inch horizon.

Soil Inclusions

A soil similar to the R soil type, but with more clay in the control section is localized areas. Soil mottles were observed and water was flowing into pit 43 when it was described in April 2007. The water table appeared to be perched on top of the underlying clay horizon at 54 inches.

Soil type P was observed in soil pit 40. Mottles were observed below 6 inches and a water table at 23 inches when the pit was described in March 2007. This soil has a dark surface (mollic) and a calcic horizon.

Dry soil profiles occur on small isolated mounds within map unit 7. These non-hydric soils include soil types L and C families. Both are very deep soils with a calcic horizon. Soil type C has a dark surface (mollic).

8 L - H - K families complex, 3 to 8 percent slopes

General Description

These soils developed in very deep alluvium on the east side of the Coal Hollow project area. They are medium to coarse textured. Evidence of a fluctuating water table was observed in most soils below 48 to 60 inches, depending on location and physiographic setting. This map unit would be a good source of cover material, but most of the disturbance in this area will be limited to cover soil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Dominant Vegetation	Typifying Soil Pedon
40	L	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf		22*
30	H	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll		20*
20	K	coarse-loamy, mixed, superactive, mesic Aridic Calciustept		21*
10	C	fine-loamy, mixed, superactive, mesic Aridic Calciustoll		

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

Colors are for dry soil unless other wise noted.

The typifying soil pedon for the L family soil in map unit 8 is soil pedon 22. The surface is pale brown sandy loam to 6 inches. The argillic and upper calcic horizon is a light yellowish brown silty clay loam and sandy clay loam to 28 inches. The underlying soil is very pale brown sandy loam to 84 inches. Mottles increase significantly below 48 inches indicating that there is fluctuating water table during wet years. This soil supports Gamble oak, snowberry, grasses, and forbs.

The typifying soil pedon for the H family soil in map unit 8 is soil pedon 20. The surface is brown loam to 6 inches. The cambic horizon is light yellowish brown clay loam to 13 inches. The calcic horizon is very pale brown to light yellowish brown sandy loam and loamy sand to 54 inches. The underlying soil is a light yellowish brown loam to 72 inches and loamy sand to 96 inches. This soil supports Pinyon pine, Utah Juniper, Gamble oak, and snowberry.

The typifying soil pedon for K family soil in map unit 8 is soil pedon 21. The surface is a light yellowish brown sandy clay loam to 8 inches. The calcic horizon is a pale brown sandy clay loam to 18 inches. The underlying soil is a pale brown strongly alkaline sandy loam to 96 inches. This soil was described in an opening of Wyoming big sagebrush within a larger area of Gamble oak.

Supporting Soil Pedons

A moist phase of the L family soil was observed in pit 47 in big sagebrush in map unit 8. A few faint mottles were observed below 24 inches. The amount of soil mottling increased significantly below 44 inches. This soil is on a low mound surrounded on three sides by wet soils in map unit 7. A water table was not observed when the pit was described in April 2007, but the mottles indicate that is common for it to rise within 44 inches of the surface in most years, and 24 inches in a very wet year.

Laboratory Analysis

The L family soil has calcium carbonate equivalents ranging from 17.5 to 23.8 percent.

The H family soil has a low saturation percentage in the 13 to 28 inch horizon (calcic). Calcium carbonate equivalents range from 16.5 to 25.4 percent. Available water capacity is 0.08 in layers of loamy sands below 28 inches.

The K family soil is characterized by strongly alkaline soil pH (8.7) below 36 inches. Calcium carbonate equivalents range from 16.8 to 29.8 percent.

Soil Inclusions

The C family soils occur within this map unit. These soils are similar to the L family soil, but have a dark surface (mollic).

9 D - W families complex, 5 to 30 percent slopes

General Description

These clayey soils are very deep and dominated by clayey textures. They have a dark surface (mollic epipedon). The D family soil has an increase in lime at 6 to 12 inches below the surface, while the W family soil has similar levels of lime throughout the soil profile. Soils in this map unit appear to have developed from the large alluvial fan that covers most of Sink Valley. The map unit is delineated along Robinson Creek and in an area south of the creek that could be the remnants of a historic channel. Vegetation is dominantly big sagebrush, rabbitbrush, and grasses with pinyon pine and Utah juniper encroaching from adjacent areas.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	D	fine, mixed, superactive, mesic Aridic Calciustoll	41*
30	W	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42*
10	A	fine, mixed, superactive, mesic Aridic Calciustept	
5		Creek bottom	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for the D family soil in map unit 9 is soil pedon 41. The surface is brown sandy clay loam to 6 inches, dark brown (moist). The lower surface is brown clay to 12 inches, dark brown (moist). The subsurface (cambic) is pale brown silty clay to 36 inches, brown (moist). The subsoil (calcic) is very pale brown silty clay loam and sandy loam to 80 inches, yellowish brown (moist).

The typifying soil pedon for W family soil in map unit 9 is soil pedon 42. The surface is brown loam 9 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 24 inches, brown (moist). The upper subsoil (lower cambic) is pale brown sandy clay loam to 36 inches, brown (moist). The lower subsoil is light yellowish brown loam to 48 inches, yellowish brown (moist).

Supporting Soil Pedons

Soil pedon 29 is representative of the D family soil in map unit 9.

Laboratory Analysis

Poor soil pH at depth and clayey horizons characterize soils in map unit 9. Soil pH is poor below 64 inches in the D family soil (pit 41) and below 36 inches in the W family soil. Horizons of silty clay and clay occur in the D family soil (pit 41) between 6 and 36 inches. The clayey horizon in the W family soil is between 9 and 24 inches.

Soil Inclusions

The channel area of Robinson Creek comprises a small portion of this map unit. The creek bottom is not vegetated.

10 U family 8 to 25 percent slopes

General Description

These clayey soils are shallow to Tropic shale and formed along the Sink Valley escarpment. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	U	Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	50*
10	T	loamy, mixed, superactive, nonacid, mesic Aridic Lithic Ustorthent	
5	B	fine, mixed, superactive, mesic Aridic Haplustepts	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Description

The typifying soil pedon for the U family soil in map unit 10 is soil pedon 50. The surface is light brownish gray clay to 4 inches, dark grayish brown (moist). The subsurface is light brownish gray clay to 19 inches, dark grayish brown and olive brown (moist). Tropic shale is at 19 inches.

Laboratory Analysis

Clayey soil texture is the main limiting feature to the U family soil in map unit 10. Lime percentage is between 18 and 19 throughout the soil profile. SAR is less than 1. Soil pH is in the good to fair range (8.1 to 8.4).

Soil Inclusions

The T family soil occurs along ridges where the Tropic shale is interbeded with sandstone. These soils are loamy and less than 20 inches deep.

Small inclusions of the B family soil occur in concave toeslope areas. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

11 A family, 8 to 25 percent slopes

General Description

These soils are very deep and are on the footslope and backslope of the Sink Valley fault escarpment. Vegetation is grasses, rabbitbrush, and big sagebrush.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	A	fine, mixed, superactive, mesic Aridic Calciustept	28*
10	B	fine, mixed, superactive, mesic Aridic Haplustepts	
5	U	Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Description

The typifying soil pedon for the A family soil in map unit 11 is soil pedon 28. The surface is grayish brown clay to 8 inches, dark grayish brown (moist). The subsurface (cambic) is gray clay with moderate blocky structure to 24 inches, grayish brown (moist). The upper subsoil (calcic, Bwk) is gray clay with common fine soft calcium carbonate masses to 48 inches, grayish brown (moist). The lower subsoil (calcic, Bk) is light grayish brown clay with common fine and medium soft calcium carbonate masses to 102 inches, grayish brown (moist).

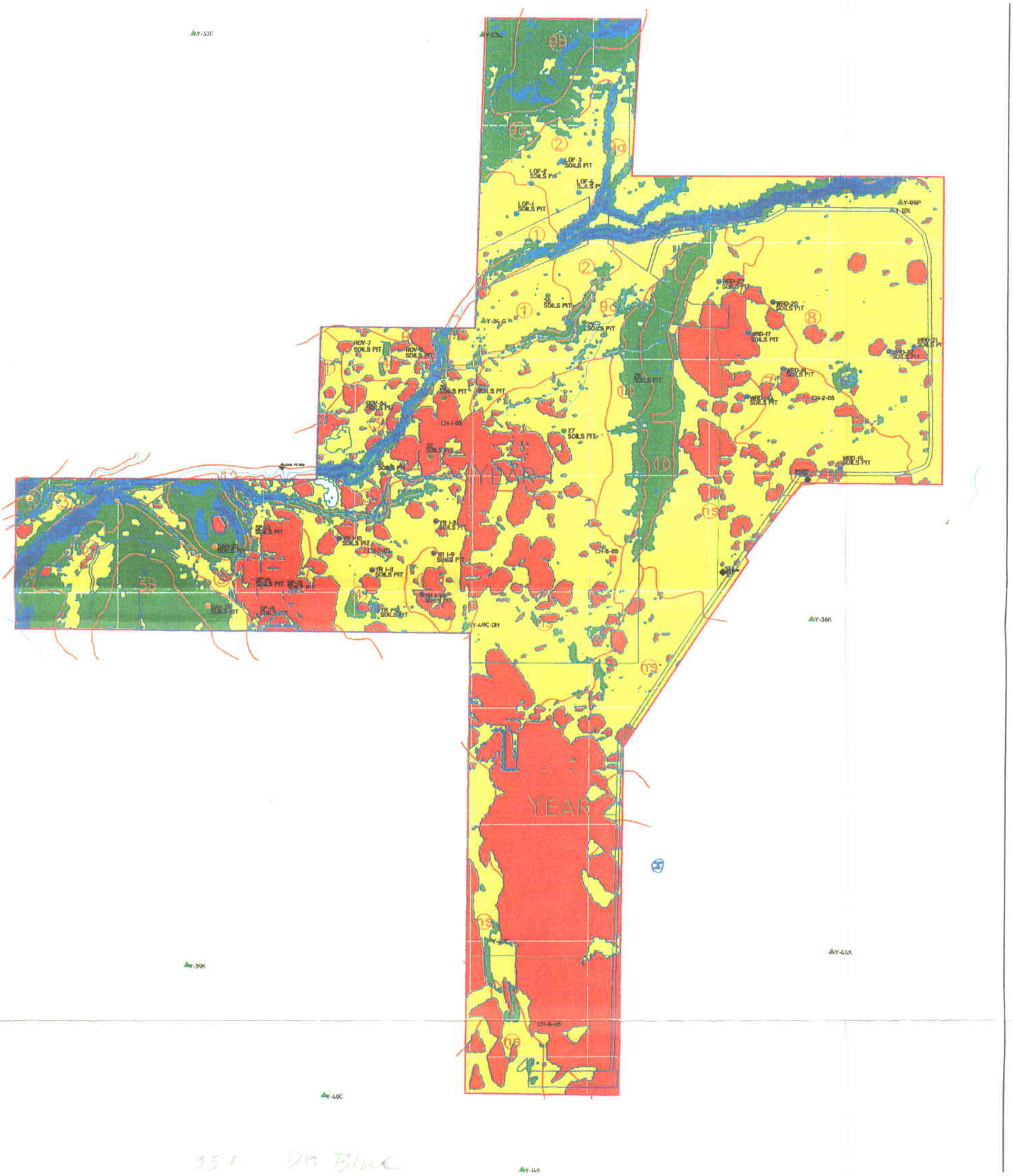
Laboratory Analysis

Clay texture is the primary limiting feature with the A family soil in map unit 11. SAR and conductivity increase significantly in the 24 to 48 inch horizon, but both are still within the fair range (Utah DOGM, 2005). Lime percentage ranges from 17 to 19. Samples were not available for analysis for the 48 to 102 inch zone.

Soil Inclusions

Inclusions of the B family soil occur along shoulders of hills and ridges. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

Small inclusions of the U family soil occur on the summits of ridges and hills. These soils are clayey and shallow (less than 20 inches) to Tropic shale.



35+ Dk Blue
13-35 Lt. Blue
Green
Yellow
Red

Typifying Soil Profile Descriptions

The following soil profile descriptions are representative of the major named soils identified in the eleven soil map units for the Coal Hollow year 1 project area. Soil texture and pH are the results of laboratory analysis of samples collected from each horizon. Photographs of the soil profiles are appendix E and photographs of the soil profile micromonolith boxes are appendix F.

A Family Soil

The A family soil occurs as major named component in map units 1 and 11. It also occurs as a minor component in map units 3, 4, and 9. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive, mesic Aridic Calciustepts

Soil pit 1 is representative of the A family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 1. It formed in alluvium deposited by a large alluvial fan over Tropic shale residuum. Slope is 3 percent on a west slope (280^{o}) on a concave fanslope. Vegetation is big sagebrush, grasses and forbs. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium platy parting to fine granular structure; soft, very friable, slightly sticky, and slightly plastic; many very fine, common fine and medium, and few coarse roots; common very fine interstitial and few fine tubular pores; strong effervescence, neutral (pH 7.3); clear smooth boundary.

Bk1 – 6 to 12 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/3) moist; moderate medium and coarse angular blocky structure; hard, very firm, very sticky, and very plastic; common very fine, few fine, medium, and coarse roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); gradual wavy boundary.

Bk2 – 12 to 24 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/3) moist; strong medium and coarse prismatic structure; very hard, very firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, strongly alkaline (pH 8.5); gradual smooth boundary.

Bk3 – 24 to 42 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/3) moist; strong medium and coarse prismatic parting to strong angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; strong effervescence, strongly alkaline (pH 8.7); clear wavy boundary.

C – 42 to 60 inches; light gray (2.5Y 7/2) clay, grayish brown (2.5Y 5/2) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; strong effervescence, moderately alkaline (pH 8.4); clear wavy boundary.

B Family Soil

The B family soil occurs as major named component in map units 2 and 5. It also occurs as a minor component in map units 3, 10, and 11. This soil is moderately deep (20 to 40 inches) to Tropic shale.

Taxonomic classification: fine, mixed, superactive, mesic Aridic Haplustepts

Soil pit 24 is representative of the B family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 5. It formed in Tropic shale residuum on a convex hillslope. Slope is 13 percent on a north northeast slope (20°). Vegetation is pinyon pine and Utah juniper with scattered big sagebrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 5 inches; dark grayish brown (2.5Y 4/3) clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky parting to medium granular structure; soft, very friable, sticky, and very plastic; common very fine, few fine, medium, and coarse roots; common very fine and few fine interstitial pores; no effervescence, slightly alkaline (pH 7.6); clear wavy boundary.

Bw1 – 5 to 17 inches; dark grayish brown (2.5Y 4/2) clay, dark grayish brown (2.5Y 4/3) moist; moderate fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; no effervescence, slightly alkaline (pH 7.7); clear wavy boundary.

Bw2 – 17 to 32 inches; light olive gray (5Y 6/2) clay, olive (5Y 5/3) moist; strong medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; no effervescence, slightly alkaline (pH 8.1); abrupt wavy boundary.

Cr – 32 inches; decomposing Tropic shale and sandstone.

C Family Soil

The C family soil occurs as major named component in map units 4 and 6. It also occurs as a minor component in map units 7 and 8. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Aridic Calciustolls

Soil pit 17 is representative of the C family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 4. It formed in alluvium and colluvium on an alluvial fan slope. Slope is 3 percent on a southwest slope (210°). Vegetation is big sagebrush, rabbitbrush and grasses with scattered pinyon pine and juniper. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium and coarse platy parting to fine granular structure; soft, friable, sticky, and plastic; many very fine, common fine and medium, and few coarse roots; common very fine interstitial and few fine tubular pores; 1 percent gravels; slight effervescence, slightly alkaline (pH 7.8); clear smooth boundary.

Bw -- 9 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate fine and medium angular blocky structure; very hard, very firm, sticky, and plastic; common very fine, few fine and medium, and coarse roots; few very fine and fine tubular pores; 2 percent gravels; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bwk1 – 18 to 30 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; strong fine and medium angular blocky structure; very hard, very firm, sticky, and plastic; few very fine, fine, and medium roots; few very fine and fine tubular pores; 2 percent gravels; strong effervescence, moderately alkaline (pH 8.0); clear wavy boundary.

Bwk2 – 30 to 45 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; strong fine and medium angular blocky structure; very hard, very firm, sticky, and plastic; few very fine and fine roots; few fine and medium tubular pores; 2 percent gravels; strong effervescence, 4 percent very fine and fine soft calcium carbonate masses, moderately alkaline (pH 8.1); gradual wavy boundary.

Bk1 – 45 to 60 inches; very pale brown (10YR 7/3) clay loam, yellowish brown (10YR 5/4) moist; strong medium and coarse subangular blocky structure; slightly hard, firm, sticky, and plastic; few very fine roots; few fine and medium tubular pores; 2 percent gravels; strong effervescence, 8 percent very fine and fine soft calcium carbonate masses, moderately alkaline (pH 8.2); gradual wavy boundary.

Bk2 – 60 to 80 inches; very pale brown (10YR 7/4) silty clay, yellowish brown (10YR 5/4) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; common very fine and few fine tubular pores; strong effervescence, 6 percent very fine and fine soft calcium carbonate masses, moderately alkaline (pH 8.0).

D Family Soil

The D family soil occurs as major named component in map units 2 and 9. It also occurs as a minor component in map units 1 and 4. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive, mesic Aridic Calciustolls

Soil pit 2 is representative of the D family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 2. It formed in colluvial landslide deposit over Tropic shale. Slope is 6 percent on a south southwest slope (200°). Vegetation is big sagebrush, rabbitbrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A1 – 0 to 7 inches; brown (10YR 5/3) clay loam, dark yellowish brown (10YR 3/2) moist; moderate medium and coarse platy parting to fine granular structure; soft, very friable, sticky, and plastic; many very fine, common fine and medium, and few coarse roots; common very fine interstitial and common fine tubular pores; strong effervescence, slightly alkaline (pH 7.6); clear smooth boundary.

A2 – 7 to 12 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium angular blocky structure; very hard, very firm, very sticky, and very plastic; common very fine, fine and medium, and few coarse roots; common very fine interstitial and few fine tubular pores; strong effervescence, slightly alkaline (pH 7.7); clear wavy boundary.

Bwk1 – 12 to 24 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/3) moist; strong medium and coarse prismatic parting fine and medium angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, slightly alkaline (pH 7.8); gradual wavy boundary.

Bwk2 – 24 to 48 inches; light brownish gray (2.5Y 6/3) clay, dark grayish brown (2.5Y 4/3) moist; strong medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; strong effervescence, slightly alkaline (pH 8.0); gradual irregular boundary.

Bk – 48 to 72 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/3) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; few very fine tubular pores; moderate effervescence, slightly alkaline (pH 7.8); gradual wavy boundary.

C – 72 to 96 inches; light gray (2.5Y 7/3) clay, grayish brown (2.5Y 5/3) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; moderate effervescence, slightly alkaline (pH 7.8).

E Family Soil

The E family soil occurs as major named component in map units 3. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Aridic Calciustepts

Soil pit 6 is representative of the E family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 3 It formed in alluvium in alluvium over Tropic shale. Slope is 3 percent on a west northwest slope (290°). Vegetation is big sagebrush, rabbitbrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A1 – 0 to 6 inches; brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4) moist; weak medium granular structure; loose, loose, non sticky, and non plastic; common very fine, few fine, common medium and few coarse roots; many very fine interstitial pores; strong effervescence, moderately alkaline (pH 8.1); clear wavy boundary.

A2 – 6 to 12 inches; yellowish brown (10YR 5/4) loamy sand, dark grayish brown (10YR 4/2) moist; weak medium subangular structure; soft, very friable, non sticky, and non plastic; common very fine and fine and few medium roots; many very fine interstitial pores; strong effervescence, moderately alkaline (pH 8.3); clear smooth boundary.

Bk1 – 12 to 24 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate fine and medium subangular structure; slightly hard, firm, slightly sticky, and non plastic; common very fine and few fine roots; common very fine interstitial and few fine tubular pores; strong effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk2 – 24 to 34 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; strong medium and coarse subangular structure; hard, very firm, non sticky, and non plastic; few very fine roots; common very fine interstitial and few fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); gradual smooth boundary.

2C – 34 to 60 inches; light brownish gray (10YR 6/2) silty clay, brown (10YR 4/3) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; slight effervescence, moderately alkaline (pH 8.3).

F Family Soil

The F family soil occurs as major named component in map unit 6. This soil is very deep (greater than 60 inches).

Taxonomic classification: coarse-loamy, mixed, superactive, mesic Aridic Calciustolls

Soil pit 15 is representative of the F family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 6 in a small alluvial basin. It formed in alluvium from Tropic shale and mixed sediments. Slope is 2 percent on a west slope (260°). Vegetation is grasses, sedges, and black sagebrush. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

Oe – 1-0 inches; dense root mat; abrupt smooth boundary.

A – 0 to 8 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium and coarse granular structure; soft, friable, slightly sticky, and non plastic; many very fine, fine, and medium and common coarse roots; common very fine interstitial pores; slight effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

Bwk – 8 to 20 inches; pale brown (10YR 6/3) loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky, and plastic; common very fine and fine, and few medium roots; many very fine and few medium and coarse tubular pores; strong effervescence, strongly alkaline (pH 8.5); abrupt wavy boundary.

Bk1 – 20 to 37 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; strong medium and coarse subangular blocky structure; very hard, very firm, sticky, and plastic; common very fine and few fine and medium roots; few very fine and fine tubular pores; strong effervescence, 4 percent very fine soft calcium carbonate masses, strongly alkaline (pH 8.7); abrupt smooth boundary.

Bk2 – 37 to 58 inches; very pale brown (10YR 7/3) loam, yellowish brown (10YR 5/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, firm, sticky, and plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, 8 percent very fine and fine soft calcium carbonate masses, strongly alkaline (pH 8.6); abrupt wavy boundary.

C1 – 58 to 73 inches; pale brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; common prominent yellowish brown mottles (10YR 5/8, moist); massive; soft, very friable, non sticky, and non plastic; few very fine and fine roots; violent effervescence, moderately alkaline (pH 8.4); abrupt smooth boundary.

C2 – 73 to 96 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; common prominent yellowish brown mottles (10YR 5/8, moist); massive; soft, very friable, non sticky, and non plastic; few very fine and fine roots; violent effervescence, moderately alkaline (pH 8.3).

G Family Soil

The G family soil occurs as major named component in map unit 6. This soil is greater than 40 inches deep.

Taxonomic classification: coarse-loamy, mixed, superactive, frigid Typic Calciaquolls

Soil pit 9B is representative of the G family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 6 in a small alluvial basin. It formed in alluvium from Tropic shale and mixed sediments. Slope is 1 percent on a south slope (190°). Vegetation is grasses, big sagebrush, and rabbitbrush. Water table was at 57 inches when pit was described on September 12, 2006. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. No laboratory analysis was completed on the 2C horizon.

A1 – 0 to 6 inches; dark grayish brown (2.5Y 4/2) loam, very dark gray (2.5Y 3/0) moist; weak medium granular structure; soft, friable, slightly sticky, and slightly plastic; many coarse, common very fine, fine, and few medium roots; many very fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bwg – 6 to 14 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse granular structure; slightly hard, firm, slightly sticky, and slightly plastic; many medium, common very fine and fine roots; common very fine tubular pores; slight effervescence, moderately alkaline (pH 8.2); abrupt smooth boundary.

Bkg – 14 to 28 inches; light grayish brown (2.5Y 6/2) sandy loam, dark gray (2.5Y 4/0) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, and slightly plastic; common very fine, fine, and medium roots; common very fine tubular pores; strong effervescence, strongly alkaline (pH 8.5); abrupt smooth boundary.

Bk – 28 to 48 inches; light gray (2.5Y 7/2) sandy loam, light olive brown (2.5Y 5/4) moist; soil to wet to identify structure structure; hard, firm, slightly sticky, and slightly plastic; few fine, and medium roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); abrupt smooth boundary.

C – 48 to 57 inches; water table at 57 inches, few very fine roots, no effervescence.

H Family Soil

The H family soil occurs as major named component in map units 4 and 8. This soil is very deep (greater than 60 inches).

Taxonomic classification: coarse-loamy, mixed, superactive, mesic Aridic Calciustolls

Soil pit 39 is representative of the H family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 4 on a fan terrace slope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 3 to 8 percent on a west slope. The area has been cultivated and planted to upland grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. No laboratory analysis was completed on 2C horizon.

Ap – 0 to 6 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, friable, slightly sticky, and slightly plastic; common very fine and fine and few medium roots; no effervescence, slightly alkaline (pH 7.8); clear wavy boundary.

A2 – 6 to 12 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky parting to medium granular structure; soft, friable, slightly sticky, and slightly plastic; few very fine, common fine and few medium roots; very slight effervescence, slightly alkaline (pH 7.8); clear smooth boundary.

Bk1 – 12 to 24 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; strong medium and coarse angular blocky structure; very hard, very firm, non sticky, and non plastic; few very fine roots; strong effervescence, 8 percent soft fine calcium carbonate masses, moderately alkaline (pH 8.0); gradual wavy boundary.

Bk2 – 24 to 36 inches; very pale brown (10YR 7/3) cobbly sandy loam, yellowish brown (10YR 5/4) moist; strong medium and coarse angular blocky structure; very hard, very firm, non sticky, and non plastic; 10 percent gravel and 5 percent cobble; few very fine roots; strong effervescence, 10 percent soft fine calcium carbonate masses, moderately alkaline (pH 7.9); gradual wavy boundary.

2C – 36 to 75 inches; very pale brown (10YR 7/3) very cobbly loamy sandy, brown (10YR 5/3) moist; strong medium and coarse angular blocky structure; very hard, very firm, non sticky, and non plastic; 15 percent gravel and 30 percent cobble; few very fine roots; strong effervescence, 15 percent soft fine calcium carbonate masses, 1 mm thick calcium carbonate concretions on bottom of rock fragments, moderately alkaline (pH 7.9); gradual wavy boundary.

I Family Soil

The I family soil is a minor component in map unit 6. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine-loamy, mixed superactive, frigid Aquic Calciustepts

J Family Soil

The J family soil occurs as major named component in map units 1, 3 and 4. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Calcidic Argiustolls

Soil pit 19 is representative of the J family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 4 on a convex fan terrace slope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 5 percent on a south west slope (260°). Vegetation is big sagebrush, rabbitbrush, grasses and scattered Utah juniper. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 6 inches; grayish brown (10YR 5/2) loam, brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky, and slightly plastic; many very fine, few fine, medium, and coarse roots; many very fine interstitial pores; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bt – 6 to 12 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, very firm, slightly sticky, and slightly plastic; few thin clay films in pores; few very fine and fine roots; few very fine and fine tubular pores; slight effervescence, moderately alkaline (pH 8.2); clear wavy boundary.

Btk1 – 12 to 24 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure;

very hard, very firm, sticky, and plastic; common medium clay films on ped faces and few thin clay films in pores; few very fine and fine roots; few very fine and fine tubular pores; strong effervescence, 4 percent very fine soft calcium carbonate masses, moderately alkaline (pH 8.2); clear wavy boundary.

Btk2 – 24 to 37 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; hard, very firm, sticky, and plastic; few thin clay films on ped faces and in pores; few fine roots; few very fine and fine tubular pores; strong effervescence, 8 percent fine soft calcium carbonate masses, strongly alkaline (pH 8.5); clear wavy boundary.

Bk1 – 37 to 51 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; strong fine and medium subangular blocky structure; hard, very firm, slightly sticky, and non plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, 4 percent fine soft calcium carbonate masses, moderately alkaline (pH 8.4); clear smooth boundary.

Bk2 – 51 to 68 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, non sticky, and non plastic; few very fine and fine roots; common very fine and few fine tubular pores; violent effervescence, 6 percent fine soft calcium carbonate masses, strongly alkaline (pH 8.5); clear wavy boundary.

Bk3 – 68 to 90 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; loose, loose, non sticky, and non plastic; many very fine interstitial pores; strong effervescence, 6 percent fine soft calcium carbonate masses, strongly alkaline (pH 8.7).

K Family Soil

The K family soils occurs as major named component in map units 8. This soil is very deep (greater than 60 inches).

Taxonomic classification: coarse-loamy, mixed, superactive, mesic Aridic Calciustepts

Soil pit 21 is representative of the K family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 8 on a convex hillslope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 2 percent on a south southwest slope (190°). Vegetation is big sagebrush and grasses surrounded by Gamble oak. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 8 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate medium and coarse subangular blocky structure; soft, very friable, non sticky, and non plastic; many very fine, common fine and medium, few coarse roots; common very fine and fine interstitial pores; very slight effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

Bwk1 – 8 to 18 inches; light brown (7.5YR 6/3) sandy clay loam, brown (7.5YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, very firm, sticky, and slightly plastic; few very fine, common very fine and few fine and medium roots; few very fine, fine, and medium tubular pores; strong effervescence, moderately alkaline (pH 8.1); clear wavy boundary.

Bwk2 – 18 to 36 inches; light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, firm, slightly sticky, and slightly plastic; common very fine and few fine and medium roots; few very fine tubular pores; slight effervescence, moderately alkaline (pH 8.4); clear wavy boundary.

Bk – 36 to 50 inches; light brown (7.5YR 6/3) sandy loam, brown (7.5YR 5/4) moist; strong medium and coarse subangular blocky structure; slightly hard, very friable, non sticky, and non plastic; few very fine roots; few very fine tubular pores; slight effervescence, strongly alkaline (pH 8.7); clear smooth boundary.

2C1 – 50 to 62 inches; pale brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, non sticky, and non plastic; few very fine and fine tubular pores; slight effervescence, strongly alkaline (pH 8.7); clear smooth boundary.

2C2 – 62 to 96 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; single grain; loose, loose, non sticky, and non plastic; many very fine and few fine tubular pores; slight effervescence, strongly alkaline (pH 8.7); clear smooth boundary.

L Family Soil

The L family soil occurs as major named component in map units 8. It also occurs as a minor component in map units 7. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Calcidic Haplustalfs

Soil pit 22 is representative of the L family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 8 on a convex hillslope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 8 percent on a southwest slope (220°). Vegetation is Gamble oak, snowberry, and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

Oe – 7 to 4 inches; oak leaves, duff and twigs.

Oi – 4 to 0 inches; partially decomposing oak leaf litter.

A – 0 to 6 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, non sticky, and non plastic; common very fine, fine and medium roots; few very fine and few fine interstitial pores; slight effervescence, slightly alkaline (pH 7.7); abrupt smooth boundary.

Btk1 – 6 to 15 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky, and plastic; few very thin clay films on ped faces; common fine and medium and few very fine and coarse roots; few very fine and fine tubular pores; slight effervescence, slightly alkaline (pH 7.7); clear smooth boundary.

Btk2 – 15 to 28 inches; light yellowish brown (10YR 6/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, and slightly plastic; common thin clay films on ped faces; few fine, medium and coarse roots; few very fine a tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bk1 – 28 to 48 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; few prominent mottles; strong medium and coarse subangular blocky structure; hard, firm, non sticky, and non plastic; few fine, medium and coarse roots; few very fine and fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear wavy boundary.

Bk2 – 48 to 60 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; common prominent mottles; massive; slightly hard, friable, non sticky, and non plastic; few fine, medium and coarse roots; common very fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear wavy boundary.

C – 60 to 84 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; many prominent mottles; massive; slightly hard, friable, non sticky, and non plastic; few very fine, fine, medium and coarse roots; many very fine interstitial pores; slight effervescence, moderately alkaline (pH 8.2).

M Family Soil

The M family soil occurs as major named component in map units 2 and 5. It also occurs as a minor component in map units 1, 4, and 9. This soil is moderately deep (20 to 40 inches) to Tropic shale.

Taxonomic classification: fine, mixed, superactive, mesic Aridic Haplustepts

Soil pit 3 is representative of the M family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 2 on a convex hillslope. It formed in formed in Tropic shale residuum. Slope is 9 percent on a south southeast slope (160°). Vegetation is big sagebrush, rabbitbrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 4 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium and coarse platy parting to moderate fine granular structure; soft, very friable, slightly sticky, and slightly plastic; common very fine and few fine and medium roots; common very fine and few fine tubular pores; slight effervescence, moderately alkaline (pH 8.1); clear smooth boundary.

Bw – 4 to 13 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; strong medium and coarse prismatic parting to strong medium angular blocky structure; slightly hard, firm, sticky, and plastic; common very fine and few fine and medium roots; common very fine interstitial and few fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); clear wavy boundary.

Bwk – 13 to 20 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/3) moist; strong medium and coarse prismatic parting to strong medium angular blocky structure; very hard, very firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.1); gradual wavy boundary.

Bk – 19 to 33 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/3) moist; strong medium and coarse angular blocky structure; very hard, very firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.4); gradual wavy boundary.

Cr – 33 inches; decomposing Tropic shale.

N Family Soil

The N family soil is occurs to a very limited extent in map unit 1. The soil is similar to the D family soil, but aquic soil conditions were identified. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive, frigid Aquic Calciustolls

O Family Soil

The O family soil occurs as major named component in map units 7. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive frigid Aeric Epiaquepts

Soil pit 38 is representative of the O family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 7 in a wet meadow east of the Sink Valley fault escarpment. It formed in formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 2 percent on a south slope (190°). Water table was at 29 inches on March 7, 2007. Vegetation is sedges, grasses, sagebrush and wild rose. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. Soil too wet to sample or describe below 40 inches.

A – 0 to 6 inches; light brownish gray (10YR 6/2) silty clay, very dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; slighty hard, friable, sticky, and plastic; many very fine, fine and common medium roots; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

AB – 6 to 12 inches; very pale brown (10YR 7/3) silty clay, yellowish brown (10YR 5/4) moist; strong fine and medium prismatic structure; hard, firm, sticky, and plastic; many very fine, fine and common medium roots; strong effervescence, 3 percent fine soft calcium carbonate masses, moderately alkaline (pH 8.3); abrupt smooth boundary.

Bk – 12 to 20 inches; light gray (10YR 7/2) silty clay, light yellowish brown (10YR 6/4) moist; 35 percent gleyed; massive; hard, firm, sticky, and plastic; violent effervescence, 25 percent fine and medium soft calcium carbonate masses, strongly alkaline (pH 8.5); abrupt smooth boundary.

Bk2 – 20 to 40 inches; white (10YR 8/1) silty clay, light gray (10YR 7/2) moist; gleyed colors; massive; hard, firm, sticky, and plastic; violent effervescence, 40 percent medium soft calcium carbonate masses, strongly alkaline (field pH 8.7).

P Family Soil

The P family soil is a minor component in map unit 7. This soil is deep (greater than 40 inches).

Taxonomic classification: fine-loamy, mixed, superactive frigid Aeric Calciaquolls

Q Family Soil

The Q family soil is a minor component in map unit 7. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive, frigid Typic Argiaquolls

R Family Soil

The R family soil occurs as major named component in map units 7 and 11. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine-loamy, mixed, superactive, frigid Typic Argiaquolls

Soil pit 18A is representative of the R family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 7 in a wet meadow east of the Sink Valley fault escarpment. It formed in formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 4 percent on a west southwest slope (250°). Water table was at 51 inches on September 14, 2006. Vegetation is sedges, grasses, and iris. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 7 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky parting to medium granular structure; soft, friable, slightly sticky, and slightly plastic; many very fine, fine and medium roots; many very fine interstitial pores; slight effervescence, slightly alkaline (pH 7.7); abrupt smooth boundary

Bw – 7 to 15 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; common faint mottles; moderate fine and medium subangular blocky structure; soft, friable, slightly sticky, and slightly plastic; few very fine and common fine and medium roots; few fine and common medium interstitial pores; moderate effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk – 15 to 30 inches; pale yellow (2.5Y 7/3) sandy loam, grayish brown (2.5Y 5/3) moist; common faint mottles; moderate fine and medium subangular structure; slightly hard, friable, slightly sticky, and non-plastic; common medium and few very fine and fine roots; few very fine tubular pores; 30

percent angular sandstone gravels; strong effervescence, moderately alkaline (pH 8.1); abrupt smooth boundary.

2Btk – 30 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many prominent mottles; moderate fine subangular structure; slightly hard, firm, slightly sticky, and slightly plastic; common medium and few very fine and fine roots; few very fine tubular pores; 35 percent clay films on ped faces; strong effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

2Cg – 45 to 60 inches; light olive brown (5Y 6/2) sandy clay loam, olive gray (5Y 5/2) moist; massive; few fine and medium roots; few fine tubular pores; violent effervescence, moderately alkaline (pH 8.0).

S Family Soil

The S family soil is a minor component in map unit 1. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive, mesic Aridic Haplustalfs

T Family Soil

The T family soil occurs as major named component in map units 5. It also occurs as a minor component in map units 10. This soil is shallow (less than 20 inches) to sandstone and shale.

Taxonomic classification: loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents

Soil pit 49 is representative of the T family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 5 in the northern portion of the Coal Hollow project area. It formed in interbeded sandstone and shale. Slope is 16 percent on a south slope (180°). Vegetation is pinyon pine, Utah juniper, black sagebrush, and Indian ricegrass. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 3 inches; light yellowish brown (2.5Y 6/4) gravelly silty clay loam, light olive brown (2.5Y 5/4) moist; weak fine and medium subangular parting to moderate fine granular structure; slightly hard, very friable, slightly sticky, and slightly plastic; common very fine and few fine, medium and coarse roots; common very fine interstitial and tubular pores; 30 percent angular sandstone gravels; strong effervescence, moderately alkaline (pH 8.1); clear smooth boundary.

C – 3 to 10 inches; light olive brown (2.5Y 5/4) gravelly loam, olive brown (2.5Y 45/4) moist; massive; slightly hard, very friable, slightly sticky, and slightly plastic; common very fine and few fine, medium and coarse roots; few very fine tubular pores; 25 percent angular sandstone gravels; strong effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

R – 10 inches; sandstone interbeded with shale.

U Family Soil

The U family soil occurs as major named component in map units 10. It also occurs as a minor component in map units 5 and 11. This soil is shallow (less than 20 inches) to Tropic shale.

Taxonomic classification: Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthents

Soil pit 50 is representative of the U family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 10 on the Sink Valley fault escarpment. It formed in Tropic shale residuum. Slope is 16 percent on a west northwest slope (292°). Vegetation is Utah juniper, black sagebrush, and Indian ricegrass. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 4 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular structure; slightly hard, very friable, sticky, and plastic; common very fine and few fine and medium roots; common very fine interstitial and tubular pores; strong effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

C1 – 4 to 11 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky, and plastic; common very fine and few fine and medium roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.1); clear smooth boundary.

C2 – 11 to 19 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky, and plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

Cr – 19 inches; decomposing Tropic shale.

V Family Soil

The V family soil was correlated to the O family during preparation of the soil survey report.

W Family Soil

The W family soil occurs as major named component in map unit 9. This soil is deep (greater than 40 inches).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Aridic Haplustolls

Soil pit 42 is representative of the W family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 9 adjacent to Robinson Creek. It formed in alluvium derived from Tropic shale and deposited by a large alluvial fan. Slope is 7 percent. Vegetation is Utah juniper, sagebrush, rabbitbrush, and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. Soils were not described below 48 inches in this pit.

A — 0 to 9 inches; brown (10YR 5/3) cobbly loam, very dark grayish brown (10YR 3.2) moist; moderate fine granular structure; soft, very friable, non-sticky, and non-plastic; common very fine and fine and few medium roots; 10 percent gravels and 5 percent cobbles; moderate effervescence, moderately alkaline (pH 7.9); clear smooth boundary.

Bw — 9 to 24 inches; pale brown (10YR6/3) cobbly silty clay, dark brown (10YR 4/3) moist; strong medium and coarse subangular blocky structure; slightly hard, firm, sticky, and plastic; few very fine, fine, and medium roots; 10 percent gravels and 5 percent cobbles; strong effervescence, moderately alkaline (pH 8.1); gradual wavy boundary.

Bwk – 24 to 36 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; strong medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, and slightly plastic; few fine and medium roots; 5 percent gravels and 3 percent cobbles; strong effervescence, moderately alkaline (pH 8.3); clear wavy boundary.

Bk – 36 to 48 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky, and non-plastic; few very fine and fine roots; trace of gravels and cobbles; strong effervescence, strongly alkaline (pH 8.6).

Soil Limiting Features

Topsoil and subsoil salvage depths were determined by the depth to carbonates, poor soil pH (greater than 8.5), salinity (EC), sodicity (SAR), texture and depth to parent material. Clayey soils, carbonate accumulations and corresponding poor pH are the primary limiting soil features in the Coal Hollow project area. The depth to each of these limiting soil features varies by soil type and map unit.

The determination of good, fair, poor, or unsuitable qualities of the topsoil and subsoil is based on the soil suitability criteria established by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (Utah DOGM, 2005). The Utah DOGM suitability guidelines are summarized in table 4-1.

Table 4-1. Soil suitability and unsuitability criteria (Utah DOGM, 2005).

Criteria	Good	Fair	Poor	Unacceptable
Saturation %	25 to 55	≥56 to 80	<25 or >80	
pH	6.5 to 8.2	6.0 to 6.4 8.2 to 8.5	5.5 to 6.0 8.6 to 9.0	<5.5 >9.0
EC (mS/cm 25°C)	0 to 4	4 to 8	8 to 15	>15
SAR	0 to 4	5 to 10	10 to 14	>14
$CaCO_3$ %	<15	15 to 30	>30	
Texture	sl, l, sil, scl, vfsl, fsl	cl, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
Total Organic Carbon	<10%			≤10%
Available Water Capacity	>0.10 moderate	0.05 to 0.10 low	<0.05 very low	
K factor	<0.37	0.37	>0.37	

Topsoil and Subsoil Salvage Depths

Table 4-2 identifies the depth of topsoil, subsoil, and clayey subsoil that may be available for salvage based on field evaluations of soil pits and laboratory analysis of soil samples. Salvage depths may include some poor quality materials when the average of mixed soil is still within the fair range. Field data sheets are in appendix B. Results of the laboratory analysis of soil samples are contained in appendix C.

Soils with less than good EC and SAR qualities were not included in the salvage depths. These soils were often associated with poor carbonate or pH levels.

Clayey subsoil soil includes clay and silty clay soil textures. It is of lesser quality relative to the other subsoil, but it is present in the native soil profiles and will be needed to achieve an adequate reclamation soil profile depth.

Actual topsoil and subsoil salvage depths will be closely monitored by Alton Coal Development staff in consultation with a certified professional soil scientist to ensure that unsuitable materials are not incorporated into the topsoil and subsoil stockpiles or placed directly into the reclamation soil profile.

Table 4-2. Topsoil and subsoil salvage depths by map unit in year 1 disturbance area.

Map Unit	Percent of Map Unit	Soil Types	Topsoil Depth	Subsoil Depth	Clayey Subsoil Depth	Average Total Salvage Depth
	%		inches	Inches	Inches	Inches
1		A - J families complex, 3 to 8 percent slopes				
	65	A	8	0	36	
	15	J	12	36	0	
	10	D	10	0	38	
	5	S	6	0	24	
	5	M	11	8	14	
		Average salvage depths[1]	9	6	29	44
2		M - B - D families complex, 3 to 8 percent slopes				
	60	M	11	8	14	
	25	B	12	0	36	
	15	D	5	0	26	
		Average salvage depths[1]	10	5	20	35
3		E - J families complex, 3 to 8 percent slopes				
	60	E	6	28	14	
	30	J	7	45	0	
	5	A	8	0	36	
	5	B	11	8	14	
		Average salvage depths[1]	7	31	11	49
4		C - H - J families complex, 3 to 8 percent slopes				
	50	C	9	39	0	
	25	H	12	36	0	
	15	J	7	45	0	
	5	D	10	0	14	
	5	A	8	0	36	
		Average salvage depths[1]	9	35	3	45
5		B - M - T families complex, 8 to 25 percent slopes				

Map Unit	Percent of Map Unit	Soil Types	Topsoil Depth	Subsoil Depth	Clayey Subsoil Depth	Average Total Salvage Depth
	%		inches	Inches	Inches	Inches
	40	B	5	0	27	
	30	M	5	0	27	
	20	T	10	0	0	
	10	U	6	13	0	
		Average salvage depths[1]	6	1	19	26
6		**F - G - C families complex, 1 to 5 percent slopes**				
	45	F	12	0	0	
	20	G	14	34	0	
	20	C	8	40	0	
	15	It	6	36	0	
		Average salvage depths[1]	11	20	0	31
7		**O - R families complex, 1 to 5 percent slopes**				
	55	O	8	0	16	
	20	R	7	41	0	
	10	Q	9	38	0	
	10	P	6	18	6	
	3	L	9	48	0	
	2	C	9	39	0	
		Average salvage depths[1]	8	16	9	33
8		**L - H - K families complex, 3 to 8 percent slopes**				
	40	L	9	48	0	
	30	H	6	66	0	
	20	K	8	40	0	
	10	C	9	39	0	
		Average salvage depths[1]	8	51	0	59
9		**D - W families complex, 5 to 30 percent slopes**				
	55	D	9	0	38	
	30	W	9	39	0	
	10	A	12	0	36	
	5	Creek bottom	0	0	0	
		Average salvage depths[1]	9	12	25	46
10		**U family, 8 to 25 percent slopes**				
	85	U	6	13	0	
	10	T	10	0	0	
	5	B	5	0	27	
		Average salvage depths[1]	6	11	1	18
11		**A family, 8 to 25 percent slopes**				
	85	A	8	0	40	
	10	B	5	0	27	
	5	U	6	13	0	
		Average salvage depths[1]	8	1	37	46

1.Average salvage depths for map unit is the sum of soil type salvage depths multiplied by percent of map unit.

Topsoil and Subsoil Quantities

The estimated quantities of topsoil and subsoil that will be salvaged from mining disturbance areas is contained in table 4-3. The estimated quantities of salvaged topsoil where facilities, roads, and stockpiles will be constructed are table 4-4. Drawing 2-2 shows the areas where only topsoil will be salvaged and where both topsoil and subsoil will be salvaged.

Table 4-3. Estimated topsoil and subsoil quantities that will be salvaged from year 1 mining disturbance areas.

Map Unit	Disturbance Area	Topsoil	Subsoil	Clayey Subsoil
	acres	cubic yards	cubic yards	cubic yards
1	23.3	28,193	18,795	90,844
2	5.7	7,663	3,832	15,327
3	25.1	23,622	104,611	37,120
4	78.2	94,622	367,974	31,541
5	13.3	10,729	1,788	33,974
6	14.7	21,740	39,527	0
7	6.9	7,421	14,843	8,349
8	0	0	0	0
9	7.4	8,954	11,939	24,872
10	0	0	0	0
11	5.2	5,593	699	25,867
Totals	179.8	208,537	564,008	267,894
Mining Area Soil Depths (inches)		9	23	11
Total (inches)				43

Table 4-4. Estimated topsoil quantities that will be salvaged where facilities, roads, and stockpiles will be constructed in Coal Hollow project area during year 1.

Map Unit	Facilities, Roads, and Stockpile Disturbance Area	Topsoil
	acres	cubic yards
1	32.3	39,083
2	12.3	18,190
3	0	0
4	8.5	10,285
5	14.5	11,697
6	0	0
7	3.8	4,087
8	10.7	11,508
9	16.3	19,723
10	1.1	887
11	6.7	7,206
Totals	106.2	122,667
Average Topsoil Replacement Depth for Non-mioning Areas (inches)		9

Native Soil Profile Features

The combined depth of topsoil and subsoil varies in native soil profiles within the Coal Hollow project area depending on physiographic setting and soil texture. The depth to which soil carbonates have leached over time is an indicator of how deep soil moisture normally penetrates. Variations in available water holding capacity (determined by soil texture, EC, and SAR) result in varying soil depths, but are similar within soil types. Table 5-1 contains the average depths to carbonates, poor soil pH, or unsuitable SAR levels by soil map unit.

Table 5-1. Average depths to limiting soil features by map unit.

Map Unit	Depth to Limiting Soil Feature	Limiting Soil Feature
	inches	
1	33	Soil carbonate accumulation.
2	37	Soil carbonate accumulation. Moderately deep to shale. Fair EC and SAR.
3	22	Soil carbonate accumulation and pH.
4	30	Soil carbonate accumulation and pH.
5	32	Moderately or shallow to shale.
6	18	Poor to unacceptable pH and carbonate accumulation.
7	30	Soil carbonate accumulation and pH.
8	36	Soil carbonate accumulation and pH.
9	36	Poor pH and soil carbonate accumulation.
10	19	Shallow to shale.
11	24	Soil carbonate accumulation.
Ave	31	Average does not include map units 6 (very limited area) ad 10 (shallow soils).

Overburden Quality

SAR and pH are limiting features of the shale overburden that can have an impact on the establishment of acceptable post mining vegetation. SAR levels in shale overburden from core hole 5 ranged from 33.4 to 52.4. The pH ranged from 8.3 to 9.5 in the core hole 5 samples. The SAR levels are well above the Utah DOGM's poor range for soil and soil substitutes. It will be important to have adequate depth of suitable cover above this unsuitable material. Utah DOGM Guidelines for Management of Topsoil and Overburden stipulates a minimum of "four feet of cover is required over any toxic or acid-forming materials (p. 4, Utah DOGM, 2005)."

SAR and pH levels in samples from core hole 3 were within the Utah DOGM good to fair range.

Reclamation Soil Profile Depth

The soil depths listed in table 5-1 represent the average depths to which natural soil development has taken place over time based on normal climatic patterns for the Alton, Utah area. Alton Coal Development will construct a post mining reclamation soil profile that is a minimum 40 inches thick when not underlain by sodic Tropic shale or any other unacceptable material. This depth is 1.3 times the native depth to limiting soils features (see table 5-1). It will hold 6.51 inches of moisture (one half of normal November, plus December through February, and one half of March precipitation) based on an available water capacity (AWC) of 0.18 inches of water per inch of soil and provide a four inch buffer above the overburden. The four inch buffer will be able to hold 0.72 inches of above normal winter precipitation (11 percent of normal). The AWC of 0.18 inches of water per inch of soil is the low end for heavy clay loams, clays, and silty clays, which are dominant in the Coal Hollow project area.

The reclamation soil profile will be increased to 48 inches when the soil texture is sandy loam, loam, clay loam, or sandy clay loam. The AWC for these soil textures ranges from 0.12 to 0.16 inches of water per inch of soil.

Stockpile and Placement of Topsoil and Subsoil

Topsoil and subsoil will be salvaged and stockpiled or directly placed in its final location separately. Alton Coal Development will minimize the stockpiling of topsoil and subsoil by implementing direct placement of these soil materials as much as possible. Direct placement of topsoil and subsoil will minimize impacts on the soil resource. Topsoil and subsoil stockpiles will be identified with signs and protected from other mining activities. Topsoil and subsoil stockpile locations are shown on Drawing 2-2.

Subsoil and clayey subsoil materials will be stockpiled or directly placed as one material. Mixing of clayey and medium textured soils will help mitigate the impacts of the clayey subsoil.

Topsoil placement depths will range from 6 to 12 inches depending on the soil type and map unit that is being salvaged. It is anticipated that the average topsoil placement depth will be 9 inches in both mined and non-mined areas.

Topsoil and subsoil stockpiles will be protected from wind and water erosion until vegetation has become established.

Substitute Subsoil

The depth of overburden overlaying the Tropic shale ranges from a few feet to forty feet or more. Laboratory analysis of this material indicates that some of it is similar in quality to the native subsoil based on the Utah DOGM soil suitability guidelines (Utah DOGM, 2005). The upper twenty to thirty feet of non-shale overburden is suitable for use as substitute subsoil, based on lab analysis of samples from deep backhoe pits at core hole locations 1, 3, 5, and 6 in April 2007. Table 5-2, shows the maximum, minimum, and average lab analysis values for the April 2006 core hole samples. The average values in table 5-2 represent an estimate of the resulting values when material from below the topsoil layer and above thirty feet is mixed during excavation. Laboratory analysis results of this overburden testing are in appendix C.

Table 5-2. Ranges and averages of soil suitability for overburden sampled from pits adjacent to core holes 1, 3, 5, and 6 in April 2007.

	Maximum	Minimum	Average
Sand % Silt % Clay % texture	82.0 61.0 61.0	0 13.0 5.0	35.3 35.9 28.8 Clay Loam
pH	8.4	7.8	8.2
ECe (ms/cm)	3.13	0.25	0.67
Saturation %	97.6	20.2	52.6
SAR	3.57	0.05	0.63
AcidBase Potential t/kT	650	160	315
Lime %	64.7	15.6	31.56
Organic Carbon	1.05	0.11	0.46
Boron	0.40	<0.10	0.29

The only parameter listed in table 5-2 with an average value that could be limiting to the establishment of vegetation would be the percent lime. Percent lime values for 9 of the 16 samples are between 15 and 30 percent, which puts them in the fair category (Utah DOGM, 2005).

ACD will salvage suitable overburden for use as substitute subsoil material from the zone below the topsoil layer (9 inches thick average) to a maximum depth of 30 feet, excluding any Tropic shale materials. ACD will do additional core hole sampling ahead of the mining operation to identify the zones in which suitable materials occur for maximum salvage potential of substitute subsoil. Representative overburden samples from the core holes will be analyzed for pH, conductivity, SAR, percent lime, and texture.

ACD will monitor pH, conductivity, texture and percent lime in the field during mining operations to ensure that only materials with good or fair suitability are placed in the upper 4 feet of the reclamation soil profile (p. 4, Utah DOGM's *Guidelines for Management of Topsoil and Overburden*, 2005). Representative overburden samples will be analyzed for SAR at a qualified laboratory.

Incoming C0250005

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service
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Cedar City, Utah 84720
Phone: (435) 586-2429
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DIV. OF OIL, GAS & MINING

Priscilla Burton
Environmental Scientist III
Division of Oil, Gas and Mining
State of Utah- Department of Natural Resources
PO Box 145801
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

RE: Prime Farmland Determination, Alton Coal Development Company, LLC, Proposed Coal Hollow Mine, C/025/0005, Task ID#2567

Dear Priscilla:

As requested, a Farmland Conversion Impact Rating (Form AD 1006) is enclosed, for the proposed Coal Hollow Mine area, located near Alton City in Kane County, Utah.

No Prime Farmland or Soils of Statewide Importance were found within the study area, per criteria outlined in the National Soil Survey Handbook Part 622 and Exhibit UT603-1, respectively. No NRCS published, or SSURGO certified soil survey data exists for the project area, so an on-site investigation, soil sampling and descriptions were used for this assessment. Although soils within the proposed activity area do not presently meet the criteria for Prime Farmland or Soils of Statewide Importance (SSI), they could classify as Soils of Statewide Importance, if irrigated.

Soils are alluvium and residuum, primarily formed from Tropic Shale parent material that exhibit mollic epipedons and contain little to no rock fragments on the soil surface or in the soil profiles, to a depth of 60 inches. Subsurface textures are typically silty clay, with the upper horizons from 0 to 27 inches ranging from silty clay loam to clay loam textures. Visible calcium carbonate and salt concentrations were observed in the soil profile, ranging from 10 inches to 27 inches deep and extending to depths of 60 inches or greater. Slopes range from 1 to 10 percent, with some minor areas exceeding 20 percent. Observed soils are predominantly Fine, mixed, superactive, mesic Pachic Calciustolls and Fine, mixed, superactive, mesic Aridic Natrustolls.

An available and reliable source of moisture to sustain crops common to the area is the primary limiting factor that excludes the observed soils from classifying as Prime Farmland or SSI. In the case of SSI, a reliable source of water is the only factor that excludes soils from classifying as such where slopes are less than 14 percent.

In addition to a lack of a reliable source of water, soils did not classify as Prime Farmland due to high pH, high electrical conductivity, excessive erosion potential on steep slopes and slow permeability rates.

Within the scope of the proposed project area, no conversion of Prime Farmland or Soils of Statewide Importance would occur because soils in the project area do not classify as such.

If you need any additional information of have questions, please do not hesitate to contact me.

Sincerely,

Corey Meier
Soil Scientist

Enclosures

Cc: Michael Domeier, State Soil Scientist, SLC, UT

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 10/30/06
Name Of Project Proposed Coal Hollow Mine	Federal Agency Involved USDA - NRCS
Proposed Land Use Coal mine	County And State Kane, Utah
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☐ No ☑	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined in FPPA Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS	

PART III *(To be completed by Federal Agency)*		Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly					
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		0.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland					
B. Total Acres Statewide And Local Important Farmland					
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted					
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value					
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		0	0	0	0
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection 10/30/06	Was A Local Site Assessment Used? Yes ■ No ☐

Reason For Selection: The project impacts Fine, mixed, superactive, mesic Pachic Calciustolls and Fine, mixed, superactive, mesic Aridic Natrustolls. No NRCS SSURGO certified soil survey presently exists for the project area. Impacted soils and determinations were evaluated by conducting a local site assessment. Observed soils do not classify as Prime Farmland, but do classify as Soils of Statewide Importance, if irrigated. Because no irrigation is present, soils do not classify as Soils of Statewide Importance.

(See Instructions on reverse side)

Form AD-1006 (10-83)

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 – Federal agencies involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form.

Step 2 – Originator will send copies A, B and C together with maps indicating locations of site(s), to the Natural Resources Conservation Service (NRCS) local field office and retain copy D for their files. (Note: NRCS has a field office in most counties in the U.S. The field office is usually located in the county seat. A list of field office locations are available from the NRCS State Conservationist in each state).

Step 3 – NRCS will, within 45 calendar days after receipt of form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland.

. Step '4 – In cases where farmland covered by the FPPA will be converted by the proposed project, NRCS field offices will complete Parts II, IV and V of the form.

Step 5 – NRCS will return copy A and B of the form to the Federal agency involved in the project. (Copy C will be retained for NRCS records).

Step 6 – The Federal agency involved in the proposed project will complete Parts VI and VII of the form.

Step 7 – The Federal agency involved in the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA and the agency's internal policies.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

Part I: In completing the "County And State" questions list all the local governments that are responsible for local land controls where site(s) are to be evaluated.

Part III: In completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them.

2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities) that will cause a direct conversion.

Part VI: Do not complete Part VI if a local site assessment is used.

Assign the maximum points for each site assessment criterion as shown in § 658.5 (b) of CFR. In cases of corridor-type projects such as transportation, powerline and flood control, criteria #5 and #6 will not apply and will, be weighed zero, however, criterion #8 will be weighed a maximum of 25 points, and criterion #11 a maximum of 25 points.

Individual Federal agencies at the national level, may assign relative weights among the 12 site assessment criteria other than those shown in the FPPA rule. In all cases where other weights are assigned relative adjustments must be made to maintain the maximum total weight points at 160.

In rating alternative sites, Federal agencies shall consider each of the criteria and assign points within the limits established in the FPPA rule. Sites most suitable for protection under these criteria will receive the highest total scores, and sites least suitable, the lowest scores.

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, adjust the site assessment points to a base of 160. Example: if the Site Assessment maximum is 200 points, and alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site "A."}$$

Taxonomic classification of the soil profiles was finalized using the field description notes, results of laboratory analysis of soil samples, and examination of the micromonolith box samples. The following diagnostic soil horizons were identified in some of the Coal Hollow soil profiles.

- Mollic epipedons (dark soil surface);
- Calcic horizon (accumulation of secondary calcium carbonates);
- Cambic horizon (indication of soil development);
- Argillic horizon (accumulation of illuvial clays);
- Aquic conditions (presence of ground water in the soil profile), and
- Lithic or paralithic contact with sandstone or shale parent material.

Mollic epipedon determination is based on the soil color using the Munsell Soil Color Charts. Surface dry colors must have a value of 5 or less with a chroma of 3 or less, while the moist color must have a value of 3 or less with a chroma of 3 or less.

Calcic horizons must be at least 6 inches thick and have secondary calcium carbonates in the subsurface or subsoil. The amount of calcium carbonate required is dependent on the percent clay in the fine-earth fraction.

Cambic horizons are an indication of early soil development. Soils with moderate or strong soil structure in the subsurface are an indication of a cambic horizon.

Argillic horizons are identified by an accumulation of illuvial clay in a subsurface horizon. The amount of clay increase is based on the overlying soil horizon. The presence of clay films in the argillic horizon is also required.

Aquic conditions are identified in the soil profile by the presence of redox concentrations, mottled soil colors, or gleyed colors. The depth at which these features occur determines the suborder (less than 20 inches) or sub-group (20 to 30 inches) classification of the soil. The presence of aquic features below 30 inches does not have an effect on the taxonomic classification of the soil, but was included in the soil type description.

Lithic or paralithic contacts are diagnostic when shale or sandstone occurs within 20 inches or the soil surface. Moderately deep contacts (20 to 40 inches deep) are identified in the soil type descriptions.

It was not possible to correlate the Coal Hollow soil profiles to established soil series. Because most of the established series within the taxonomic soil families were from areas with warmer soil temperatures, longer growing seasons, or other dissimilar features. Most of the established soil series were from eastern New Mexico, southeastern Colorado, northeastern Wyoming, or the Dakotas. Soils in the Alton, Utah area have not been mapped by the Natural Resource Conservation Service (C. Meier, 2006).

Table B-1. Taxonomic classification of soil pedons, Coal Hollow Soil Survey, year 1.

Pedon	Soil Type	Map Unit	Taxonomic Family Classification
LOF-1	A	1	fine, mixed, superactive, mesic Aridic Calciustept
LOF-2	D	2	fine, mixed, superactive, mesic Aridic Calciustept
LOF-3	M	2	fine, mixed, superactive, mesic Aridic Calciustept
LOF-4	B	2	fine, mixed, superactive, mesic Aridic Haplustepts
RDV-5	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
RDV-6	E	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
RDV-7	D	4	fine, mixed, superactive, mesic Aridic Calciustoll
1YR-8	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9A	F	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9B	G	6	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll
1YR-10	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-11	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-12	M	2	fine, mixed, superactive, mesic Aridic Calciustept
SP-13	E	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-14	I	6	fine-loamy, mixed, superactive, frigid Aquic Calciustept
SP-15	F	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-16	C	6	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-17	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-18A	R	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
WRD-18B	C	4	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
WRD-19	J	4	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
WRD-20	H	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-21	K	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustept
WRD-22	L	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
WRD-23	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
DAH-24	B	5	fine, mixed, superactive, mesic Aridic Haplustepts
DAH-25	M	5	fine, mixed, superactive, mesic Aridic Calciustept
SP-26	N	1	fine, mixed, superactive, frigid Aquic Calciustoll
SP-27	A	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-28	A	11	fine, mixed, superactive, mesic Aridic Calciustept
SP-29	D	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-30	A	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-31	J	3	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-32	J	1	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-33	D	1	fine, mixed, superactive, mesic Aridic Calciustoll
SP-34	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-35	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-36	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-37	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-38	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-39	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-40	P	7	fine-loamy, mixed, superactive, frigid Aeric Calciaquoll
SP-41	D	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-42	W	9	fine-loamy, mixed, superactive, mesic Aridic Haplustoll
SP-43	Q	7	fine, mixed, superactive, frigid Typic Argiaquoll
SP-44	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-45	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-46	R	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
SP-47	L	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
SP-48	S	1	fine, mixed, superactive, mesic Aridic Haplustalf
SP-49	T	5	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent
SP-50	U	10	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent

Table B-2. Taxonomic classification of soil pedons sorted by soil type, Coal Hollow Soil Survey, year 1.

Pedon	Soil Type	Map Unit	Taxonomic Family Classification
LOF-1	A	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-27	A	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-28	A	11	fine, mixed, superactive, mesic Aridic Calciustept
SP-30	A	1	fine, mixed, superactive, mesic Aridic Calciustept
LOF-4	B	2	fine, mixed, superactive, mesic Aridic Haplustepts
DAH-24	B	5	fine, mixed, superactive, mesic Aridic Haplustepts
RDV-5	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-8	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-10	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-16	C	6	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-17	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-18B	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-23	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-34	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-35	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
LOF-2	A	2	fine, mixed, superactive, mesic Aridic Calciustoll
RDV-7	D	4	fine, mixed, superactive, mesic Aridic Calciustoll
SP-29	D	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-33	D	1	fine, mixed, superactive, mesic Aridic Calciustoll
SP-41	D	9	fine, mixed, superactive, mesic Aridic Calciustoll
RDV-6	E	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-13	E	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
1YR-9A	F	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-15	F	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9B	G	6	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll
1YR-11	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-20	H	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-36	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-37	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-39	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-14	I	6	fine-loamy, mixed, superactive, frigid Aquic Calciustept
WRD-19	J	4	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-31	J	3	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-32	J	1	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
WRD-21	K	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustept
WRD-22	L	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
SP-47	L	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
LOF-3	M	2	fine, mixed, superactive, mesic Aridic Calciustept
1YR-12	M	2	fine, mixed, superactive, mesic Aridic Calciustept
DAH-25	M	5	fine, mixed, superactive, mesic Aridic Calciustept
SP-26	N	1	fine, mixed, superactive, frigid Aquic Calciustoll
SP-38	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-44	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-45	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-40	P	7	fine-loamy, mixed, superactive, frigid Aeric Calciaquoll
SP-43	Q	7	fine, mixed, superactive, frigid Typic Argiaquoll
SP-46	R	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
WRD-18A	R	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
SP-48	S	1	fine, mixed, superactive, mesic Aridic Haplustalf
SP-49	T	5	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent
SP-50	U	10	clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent
SP-42	W	9	fine-loamy, mixed, superactive, mesic Aridic Haplustoll

Table B-3. Taxonomic classification of soil pedons sorted by map unit, Coal Hollow Soil Survey, year 1.

Pedon	Soil Type	Map Unit	Taxonomic Family Classification
LOF-1	A	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-27	A	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-30	A	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-33	D	1	fine, mixed, superactive, mesic Aridic Calciustoll
SP-32	J	1	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-26	N	1	fine, mixed, superactive, frigid Aquic Calciustoll
SP-48	S	1	fine, mixed, superactive, mesic Aridic Haplustalf
LOF-2	A	2	fine, mixed, superactive, mesic Aridic Calciustept
1YR-12	M	2	fine, mixed, superactive, mesic Aridic Calciustept
LOF-3	M	2	fine, mixed, superactive, mesic Aridic Calciustept
LOF-4	B	2	fine, mixed, superactive, frigid Aridic Haplustepts
RDV-6	E	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-13	E	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-31	J	3	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
RDV-5	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-8	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-10	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-17	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-18B	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-23	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-34	C	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-35	C	4	fine-loamy, mixed, superactive, mesic Ardidic Calciustoll
RDV-7	D	4	fine, mixed, superactive, mesic Aridic Calciustoll
1YR-11	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-36	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-37	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-39	H	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-19	J	4	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
DAH-24	B	5	fine, mixed, superactive, mesic Aridic Haplustepts
DAH-25	M	5	fine, mixed, superactive, mesic Aridic Calciustept
SP-49	T	5	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent
SP-16	C	6	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9A	F	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-15	F	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9B	G	6	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll
SP-14	I	6	fine-loamy, mixed, superactive, frigid Aquic Calciustept
SP-38	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-45	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-44	O	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-40	P	7	fine-loamy, mixed, superactive, frigid Aeric Calciaquoll
SP-43	Q	7	fine, mixed, superactive, frigid Typic Argiaquoll
SP-46	R	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
WRD-18A	R	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
WRD-20	H	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-21	K	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustept
WRD-22	L	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
SP-47	L	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
SP-29	D	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-41	D	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-42	W	9	fine-loamy, mixed, superactive, mesic Aridic Haplustoll
SP-50	U	10	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent
SP-28	A	11	fine, mixed, superactive, mesic Aridic Calciustept

Hvridic UTM 0611523 4140[illegible]

USDA - F[illegible] ice Fine, [illegible], superactive mesic

SOIL DESCRIPTION
(NFS ... FSH 2509.18) 13 (P) LOF-1

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
1	FINE, SMECTITIC TYPIC USTORTHENT	9-12-06	BC	2-3(K)	LOF 1	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
LOOKOUT MEA COAL HOLLOW PROJECT	PRIVATE LAND 2 MI SOUTH OF ALTON, UTAH		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind / b. Class
LANDSLIDE DEPOSIT ALLUVIUM + COLLUVIUM	STRAIGHT CLIFFS FM + TROPIC SHALE	70	a. Kind NONE -> SLIGHT b. Class RILL

18. Landform	19. Slope:	20. Drainage Class	21. Surface Stone and Rock
ALLUVIAL FANSLOPE	a. % 3 b. Shape PLANAR c. Length 150' d. Aspect 280	SPD	a. CR 2 b. CB 1 c. ST 0 d. BY ___

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
WYOMING BIGSAGEBRUSH - GRASSES, FORBS	15-17"		> 5 FT

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	LAB TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	LAB/FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 4/2	10YR 5/2	/	CLAY LOAM SICL 36	1MPL → FGR	SO	VFR	SS/PS	/	CR-0 CB-0 ST-0	3VF 2F,M 1C	2VF IN 1F TU	ST	7.3	C,S
CK1	6-12	2.5Y 4/3	2.5Y 5/2	/	CLAY LOAM SIC 36	2M-C ABK	HA	VFI	VS/VP	/	CR-0 CB-0 ST-0	2VF 1F,M,C	1VF TU	ST	8.3	G,W
CK2	12-24	2.5Y 5/3	2.5Y 6/2	/	SIC 42	3M-C PR	VH	VFI	VS/VP	/	CR-0 CB-0 ST-0	1VF 1F	1VF TU	ST	8.5	G,S
C3	24-42	2.5Y 5/3	2.5Y 6/2	/	SIC 46	3MPR → 3ABK	EHA	EFI	VS/VP	/	CR-0 CB-0 ST-0	1VF	V.1VF TU	ST	8.7	G,W
Cr	42-60	2.5Y 5/2	2.5Y 7/2	/	CLAY SIC 42	MASSIVE	EH	EFI	VS/VP	/	CR-0 CB-0 ST-0	/	/	ST	8.4	G,W
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CH- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	42"		> 5 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	CALCIC	10-30"

SOIL DESCRIPTION

(N-[illegible] SII 2509.18) #14 (P) 1 OF 2

USDA - Forest Service

UTM 0371351 / 4[illegible] 792

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location
MU [illegible] ~~LEAD-OUT~~ AAB	Aridic Ustic Haplocalcid; ~~mixed~~, superactive, mesic; Fine, smectitic Typic Ustorthent	9-12-06	BC	4-5-(16)	1 OF 2	Alton	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow Soil Survey	Private lands 2 mi. south of Alton	Utah	Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Landslide deposit; Landslide - colluvium	Tropic Sh + Str. Cliffs	FN 70	None → Slight	Rill

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock
Footslope - Toeslope	6	Planar	150'	200	SPD	a. CR 2 b. CB 2 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Artrva - Rabbitbrush - Grasses	15-17"		>8 Ft.

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	Mottling (3)	LAB TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-7	10YR 3/2	10YR 5/3	/	Clay loam; SiL; 31	2M-C PL → FCR	SO	VFR	S/P	/	CR- / CB- / ST-	3VF 2F,M 1C	2VF IN 2F TU	ST	7.6	C, S
Ck1	7-12	10YR 4/2	10YR 5/2	/	Clay loam; SiC; 32	2M-F ABK	VH	VFI	S/VP	/	CR- / CB- / ST-	2VF 2F,M 1C	2VF IN 1F TU	ST	7.7	C, W
Ck2	12-24	2.5Y 4/3	2.5Y 6/2	/	SiC; 46	3C-M PR → 3ABK	EHA	EFI	VS/VP	/	CR- / CB- / ST-	1VF-F	1VF TU	ST	7.8	G, W
Ck3	24-48	2.5Y 4/3	2.5Y 6/3	/	Clay; SiC; 41	3M-C ABK	EHA	EFI	VS/VP	/	CR- / CB- / ST-	V1VF	1VF TU	ST	8.0	G, I
C4	~~48~~ 48-72	2.5Y 5/3	2.5Y 7/2	/	SiC; 45	MASSIVE	EHA	EFI	VS/VP	/	CR- / CB- / ST-	/	1VF TU	SE	7.8	G, W
Cr	72-96	2.5Y 5/3	2.5Y 7/3	/	CLAY; 47	MASSIVE	EHA	EFI	VS/VP	/	CR- / CB- / ST-	/	/	SE	7.8	G, W
											CR- / CB- / ST-					
											CR- / CB- / ST-					
											CR- / CB- / ST-					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40	38	0	> 5 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	—	10-30"

FS-2500-1 (7/06)

USDA - Forest Service

4 MPLES TAKEN (Refer FSII 2509.18) 50-51(K) UTM 4140866

1. Map Unit	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
2	FINE, SMECTITIC, SUPERACTIVE MESIC TYPIC USTORTHENT	9-18	BC	16-11(P)	LOF-3	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
LOAD OFF AREA	MODERATELY DEEP		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM/COLLUVIUM/USD	TROPIC/STR. CLIFFS	70	NONE-SLIGHT	RILL

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
FANSLOPE - TOESLOPE	9	CONVEX	200	160°	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH - RABBITBRUSH	15-17		NONE TO 5 FT

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-4	10YR 3/3	10YR 4/3	/	LOAM SIL	28	1M-CPL → FGR	SO	VFR	SS PS	/	GR - / CB - / ST -	2VF 1F,M	2VF IN 1F TU	SE	8.1	G,S
C1	4-11	10YR 4/3	10YR 5/2	/	SILTY CLAY LOAM SICL	28 32	3M-CPR 3 ABK	SH	FI	S P	/	GR - / CB - / ST -	2VF 1F,M	2VF IN 1F TU	ST	8.3	G,W
C2	11-19	2.5Y 4/3	2.5Y 6/2	/	SICL SILTY CLAY	34	3MPR → 3 ABK	VH	VFI	VS VP	/	GR - 0 / CB - 0 / ST - 0	1VF 1F	1VF TU	ST	8.1	G,W
C3	19-33	2.5Y 5/3	2.5Y 6/2	/	SILTY CLAY SICL	40 37	3 M-C ABK	VH	VFI	VS VP	/	GR - 0 / CB - 0 / ST - 0	1VF	1VF TU	ST	8.4	G,W
Cr	33+	SOFT TROPIC			~~SICL~~	45	SHALE BEDROCK					GR - / CB - / ST -					
												GR - / CB - / ST -					
												GR - / CB - / ST -					
												GR - / CB - / ST -					
												GR - / CB - / ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-33"	37	0	33"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	CALCIC	10-30"

Previous edition ...lete.

FS-2500-1 (2/86)

USDA - Forest Service — Aridic [illegible] — SOIL DESCRIPTION (Refer FSH 2509.18) 52-53 K — UTM 414 6

1. Map Unit	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
2	mixed mesic FINE SMECTITIC TYPIC USTORTHENT	9-18-06	BC	12-13 (P)	LOF-4	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
LONDON FAULTY COAL HOLOW SOIL SURVEY	PRIVATE LANDS 2½ MI. SE OF ALTON		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
COLLUVIUM	LANDSLIDE DEPOSITS FROM STRAIGHT CLIFFS + TROPIC	70	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock
TOESLOPE . FANSLOPE	6	CONVEX	220	190	SPD	CHEMICAL CRUST a. GR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH- RABBITBRUSH	15-17"		NONE TO 5FT.

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	(LAB) TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-5	10YR 4/2	10YR 6/3	/	SILTY CLAY SIL 42 23	2M-F PL → 1FGR	SO	VFR	SS PS	/	GR-0 CB-0 ST-0	3VF 2F-M 2C	3VFIN	SE	7.8	C,S
Bw1 C1	5-10	10YR 4/2	10YR 6/2	/	SIC 40	2M-F SBK	SO	FR	S P	/	GR-0 CB-0 ST-	2VF-F 1M,C	2VFIN 2FTU	ST	7.7	C,W
Bw2 C2	10-19	2.5Y 4/2	2.5Y 6/2	/	SIC 45	3C-M PR	VH	VFI	VS VP	/	GR-0 CB-0 ST-0	1VF-F 1M	2VFIN	ST	7.8	G,W
Bw3 C3	19-31	2.5Y 4/3	2.5Y 6/3	/	SIC 44	3MPR → 3ABK	VH	VFI	VS VP	/	GR-0 CB-0 ST-0	VIVF	1VFIN	ST	7.9	G,W
C4	31+ *			/	CLAY SIC or	CLAY MASSIVE	EH VE	EFI	ES EP		GR-0 CB-0 ST-0	/	1VF TU	ST	7.8	
											GR- CB- ST-					
	* NO LAB	ANALYSES									GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	42	0	> 50 water

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	CALCIC ?	10-30

Previous edition ... lete. — FS-2500-1 (2/86)

Moved [illegible] for calc to Aridic Calcixerts

USDA - Forest Service

SOIL DESCRIPTION

(Reference 2509.18)

Aridic Calciustoll

RDV-5 / UTM 414 8

FLUVENTIC HAPLUSTOLL

1. Map Unit Symbol	4
2. Family or Series	FI-LOAMY, mixed, super, mesic HAPLOBOROLL
3. Date	9/13/06
4. By	BC
5. Photo No.	13-14-15-16
6. Stop No.	
7. USGS Quad	ALTON
8. Location:	Sec. T. R.
9. Area	COAL HOLLOW
10. Forest	
11. Ranger District	
12. State	UT
13. County	KANE
14. Parent Material	ALLUVIUM / RESIDUUM
15. Bedrock Name	MIXED SEDIMENTARY
16. Elevation	
17. Erosion: a. Kind	NONE
b. Class	
18. Landform	ALLUVIAL FANSLOPE
19. Slope: a. %	4
b. Shape	CONVEX
c. Length	170'
d. Aspect	250°
20. Drainage Class	WD
21. Surface Stone and Rock	a. CR 0 b. CB 0 c. ST 0 d. BY 0
22. Potential Natural Vegetation	PINYON-JUNIPER W/ BIG SAGEBRUSH
23. Annual Precipitation	15-17"
24. Measured Soil Temperature	
25. Water Table (Depth)	NONE

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	LAB TEXTURE (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB/FIELD pH (i)	BOUNDARY (j)
A1	0-5	10YR 3/3	10YR 5/3	/	LOAM	18	2M-F GR	SO	VFR	SO/PO	/	GR-0 CB-0 ST-0	2VF 2F 1C	3VF IN 2F TU	SE	8.1	C,W
A2	5-10	10YR 3/4	10YR 5/4	/	LOAM	20	2M-F SBK	SH	FR	SO/PO	/	GR- CB- ST-	2F 1VF 1M-C	2VF-F IN	ST	8.1	G,W
Bk Cwt	10-25	10YR 5/4 10YR 5/6	10YR 6/4 (80) 10YR 6/6 (20)	/	SANDY LOAM	14	2C-M SBK	HA	FI	SS/PO	/	GR- CB- ST-	1VF 1F	2VF-F TU	ST	8.4	A,S
2Ct	25-48	2.5Y 5/3	2.5Y 6/2	/	SILT LOAM	12	3M-C ABK	EH	EF	SS/SP	/	GR- CB- ST-	V.VF	1VF TU	ST	8.8	G,W
2C2	48-60	2.5Y 5/2	2.5Y 7/2	/	LOAM	22	MASSIVE	EH	EF	SS/PS	/	GR- CB- ST-	/	1VF TU	ST	9.0	
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					

26. Particle Size Control Section a. Depth:	10-40"
b. Average Clay %:	15
c. Average Rock Fragment Content:	0
27. Depth to Lithic or Paralithic Contact:	>60 INCHES
28. Diagnostic Horizons a. Surface:	MOLLIC
b. Subsurface:	CAMBIC / CALCIC
29. Moist Control Section Depth:	10-30"

FS-2500-1 (2/06)

SOIL DESCRIPTION

(Re... ...SH 2509.18)

USDA - Fore... ...ice

Aridic ... Ust I Fluvent—OR ~~Mollic~~ ROJ-6 UTM ≠ 0870421 414020

1. Map Unit Symbol	3
2. Family or Series	Co-Loamy ~~fine~~ ~~sand~~ Haploboroll R (...) mixed, super, mesic
3. Date	9-13-06
4. By	BC
5. Photo. No.	17, 18-19
6. Stop No.	ROJ-6
7. USGS Quad	Acton
8. Location: Sec. T. R.	
9. Area	Cool Hollow
10. Forest	
11. Ranger District	
12. State	UT
13. County	KANE
14. Parent Material	ALLUVIUM OVER RESIDUUM
15. Bedrock Name	TROPIC SHALE
16. Elevation	68
17. Erosion: a. Kind	NONE
b. Class	
18. Landform	
19. Slope: a. %	3
b. Shape	PLANE
c. Length	250'
d. Aspect	290°
20. Drainage Class	WD
21. Surface Stone and Rock: a. CR	0
b. CB	0
c. ST	0
d. BY	0
22. Potential Natural Vegetation	BIG SAGEBRUSH - RABBITBRUSH
23. Annual Precipitation	15-17"
24. Measured Soil Temperature	
25. Water Table (Depth)	>8 Ft

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	LAB TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A1	0-6	10YR 3/4	10YR 5/3	/	LSAND 6	1MGR	LO	LO	SO/PO	/	CR - / CB - / ST -	3VF, IF 2M, IC	3VF IN	ST	8.1	C,W
A2	6-12	10YR 4/2	10YR 5/4	/	LSAND 6	1MSBK → SG	SO	VFR	SO/PO	/	CR - / CB - / ST -	2VF, 2F 1M	3VF IN	ST	8.3	C,S
Bk1 ~~AC~~	12-24	10YR 4/3	10YR 6/3	/	LOAM 18	2M-F SBK	SH	FI	SS/PO	/	CR - / CB - / ST -	2VF 1F	2VF IN 1F TU	ST	8.0	A,S
Bk2 Ck	24-34	10YR 4/3 10YR 4/6	10YR 6/3 10YR 6/6	(75) (25)	SANDY LOAM 8	3M-C SBK	HA	VH	SO/PO	/	CR - / CB - / ST -	1VF	2VF IN 1F TU	ST	8.3	G,S
2C	34-60	10YR 4/3	10YR 6/2	/	SILTY CLAY 40	MASSIVE	EH	EFI	VS/VP	/	CR - 0 / CB - 0 / ST - 0	1VF	1VF TU	SE	8.5	

26. Partical Size Control Section: a. Depth	10-40"
b. Average Clay %	<10
c. Average Rock Fragment Content	0
27. Depth to Lithic or Paralithic Contact	>60"
28 Diagnostic Horizons: a. Surface	MOLLIC W/MIXING
b. Subsurface	CALCIC
29. Moist Control Section Depth	10-30"

PSC Clay is 18.3% based on lab data

USDA - Fore[illegible]ce

SOIL [illegible]CRIPTION

(Re[illegible] SII 2509.18)

RDV-7

UTM 03709[illegible]
4140[illegible]

mixed, super, mesic

1. Map Unit Symbol: 4

2. Family or Series: Aridic Calciustoll; ~~Haplargid~~; Fine; Typic; ~~Ustorthent~~

3. Date: 9-13-06

4. By: BC

5. Photo. No.: 20, 21

6. Stop No.: RDV-7

7. USGS Quad: ALTON

8. Location: Sec. ____ T. ____ R. ____

9. Area: COAL HOLLOW

10. Forest: APPROX. 2 MI SE OF ALTON PRIVATE LAND

11. Ranger District:

12. State: UT

13. County: KANE

14. Parent Material: ALLUVIUM OVER RESIDUUM

15. Bedrock Name: MIXED ALLUVIUM / TROPIC SHALE

16. Elevation:

17. Erosion: a. Kind: NONE b. Class

18. Landform: FANSLOPE

19. Slope: a. % 3 b. Shape SL CONVEX c. Length 150' d. Aspect 255°

20. Drainage Class: SPO

21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation: BIG SAGEBRUSH - RABBITBRUSH

23. Annual Precipitation: 15-17"

24. Measured Soil Temperature:

25. Water Table (Depth): > 6 FT

HORIZON DESIGNATION (a)	DEPTH (b) INCHES	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d) (LAB)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i) LAB	BOUNDARY (j)
A1	0-6	10YR 3/2	10YR 5/2	/	CLAY LOAM	23	1M-F GR	SO	VFR	SS/PS	/	CR - / CB - / ST - /	3VF 3F 2M, 1C	3VF IN	SE	7.5	C, W
A2	6-12	10YR 4/3	10YR 5/2	/	CLAY	44	2M-F SBK	HA	FI	VS/VP	/	CR - / CB - / ST -	2VF 2F, M 1C	2VF IN 1F TV	SE	7.6	G, W
Bk1 (~~2Ak~~)	12-24	2.5Y 4/2	2.5Y 6/2	/	CLAY	47	2C-M ABK	HA	EFI	VS/VP	/	CR - / CB - / ST -	1F, 1M	1VF TV	ST	8.0	G, S
Bk2 (~~2Ck~~)	24-60	2.5Y 4/3	2.5Y 6/2	/	CLAY	44	3C-M ABK	VH	EFI	VS/VP	/	CR - 0 / CB - 0 / ST - 0	/	1VF TV	ST	8.0	

26. Partical Size Control Section: a. Depth: 10-40" b. Average Clay %: 45 c. Average Rock Fragment Content: 0

27. Depth to Lithic or Paralithic Contact: > 60"

28. Diagnostic Horizons: a. Surface: MOLLIC W/ MIXING b. Subsurface: CALCIC

29. Moist Control Section Depth: 10-30"

FS-2500-1 (7/06)

USDA - For[redacted]ke

SOI[redacted]SCRIPTION

(Ref[redacted] SII 2509.18) KUDAM

UTM 037[redacted] 4139829

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
34	Super, mesic Aridic Calciustoll; Fi-Lmy Entic, ~~Aridic~~ mixed, Haplustoll	9-12-06	BC	2 PITS	1YR-8	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
1YR COAL HOLLOW MINE	3 M. SE OF ALTON PRIVATE LAND		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM	MIXED SEDIMENTARY		NONE	

19. Slope: a. % 2 b. Shape CONCAVE c. Length 100' d. Aspect 230°

20. Drainage Class: WELL WD

21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0

18. Landform: ALLUVIAL FAN

22. Potential Natural Vegetation: BIG SAGEBRUSH, PINYON, CHINA

23. Annual Precipitation: 15-17"

24. Measured Soil Temperature:

25. Water Table (Depth): > 7 1/2 FT

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	Mottling (3)	TEXTURE (LAB) (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD (LAB) pH (i)	BOUNDARY (j)
A	0-8	10YR 3/3	10YR 5/3	/	SILT LOAM	30 22	1M PL → 2MGR	SO	FR	SS PO	/	CR-0 CB-0 ST-0	3VF 2F,M	3VF IN	NE	8.0	C,S
Bulk AB ~~Bt~~	8-14	10YR 4/3	10YR 6/3	/	Silt loam	30	2M-F SBK	HA	FI	S/P	/	CR-0 CB-0 ST-0	2VF 1F,M	2VF IN 1F TU	SE	8.1	C,W
Bulk Bw ~~Btk~~	14-22	10YR 4/4	10YR 7/3	/	LOAM / S.CL	22	2C-M SBK	HA	VFI	S/P	/	CR-0 CB-0 ST-0	1F 1VF	1VF,F TU	ST	8.5	C,W
Bulk Bk2	22-45	10YR 5/4	10YR 7/3	/	LOAM SIL	16	2M-F SBK	HA	VFI	SO PO	/	CR-0 CB-0 ST-0	1VF	1VF,F TU	ST	8.9	G,S
2C1	45-65	10YR 5/4	10YR 7/4	/	LOAMY SAND SL	8 14	MASSIVE	SO	FR	SO PO	/	CR-0 CB-0 ST-0	1VF	1VF TU	ST	9.0	G,S
2C2	65-85	10YR 5/3	10YR 7/4	/	LOAMY SAND SL	8 12	MASSIVE				/	CR-0 CB-0 ST-0	/	3VF IN	SE	8.9	
			A	0-5"	CLAY		LOAM TEXTURES					CR- CB- ST-					
												CR- CB- ST-					
												CR- CB- ST-					

26. Partical Size Control Section: a. Depth: 10-40" b. Average Clay %: 19 c. Average Rock Fragment Content: 0

27. Depth to Lithic or Paralithic Contact: >60

28. Diagnostic Horizons: a. Surface: MOLLIC W/MIXING b. Subsurface: CAMBIC

29. Moist Control Section Depth: 10-30"

FS-2500-1 (2/86)

Aridic Calciustoll SOIL DESCRIPTION UTM 4[redacted]-21

USDA - Fore[redacted]ce ~~FLUVENTIC HAPLUSTOLL~~ (Refer[redacted] 11 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
6	COARSE-LOAMY, mixed, super, mesic HAPLUSTOLL ~~FRISTIY~~ (or FI-10)	9-12-06	BC		1YR9A	ALTON	Sec. ___ T. [redacted] R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
1 YEAR MINE	3 MILES SOUTH OF ALTON PRIVATE LAND		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
MIXED ALLUVIUM	STRAIGHT ALLUVIUM FRM CLIFFS		NONE	

18. Landform: FANSLOPE BASIN

19. Slope: a. % 4 b. Shape CONCAVE c. Length 75' d. Aspect 315°

20. Drainage Class: WD → SPD

21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation: GRASS + SEDGES w/ FEW SAGEBRUSH

23. Annual Precipitation: 15-17

24. Measured Soil Temperature:

25. Water Table (Depth): > 7 FEET

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	LAB TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
Oe	1½-0	ROOT	MAT			2..					CR-0 CB-0 ST-0			SL		
A	0-12	10YR 3/3	10YR 5/3	/	SANDY LOAM 8 SL 20	2M-F GR	SO	FR	SO/PO	/	CR-0 CB-0 ST-6	3VF 2F	3VF IN	SE	9.1	C,S
Bw	12-24	10YR 4/3	10YR 6/3	/	SANDY LOAM 10 22	2M-F SBK	HA	FI	SS/PS	/	CR-0 CB-0 ST-0	2VF 2F	2VF IN 1F-M TU	SE	9.6	C,S
Bwk	24-42	10YR 5/4	10YR 7/3	/	SANDY LOAM 10	2M-C SBK	HA	VFI	SS/PS	/	CR-0 CB-0 ST-0	2VF 1F	2VF, 1M 2F TU	SE	9.6	C,S
Bk Bg	42-70	10YR 5/4 10YR 5/6	10YR 7/4 (80) 10YR 7/6 (20)	FEW FAINT 7.5YR 4/6	SANDY LOAM 10	MASSIVE	HA	FI	SO/PO	/	CR-0 CB-0 ST-0	1VF	1VF-F TU	SE	9.4	A,S
2Cg	70-100	2.5Y 5/2	2.5Y 6/1	COMMON DISTINCT 10YR 6/6	CLAY LOAM 39	MASSIVE	SH	FR	SO/PO	/	CR-0 CB-0 ST-0	1VF	1VF TU	NE	8.5	A S
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

26. Partical Size Control Section: a. Depth: 10-40" b. Average Clay %: 10 c. Average Rock Fragment Content: 0

27. Depth to Lithic or Paralithic Contact: > 8 FEET

28. Diagnostic Horizons: a. Surface: MOLLIC b. Subsurface: CAMBIC

29. Moist Control Section Depth: 10-30"

calcic based on lab data

FS-2500-1 (2/86)

SOIL [redacted]SCRIPTION

(Refe[redacted] .11 2509.18)

USDA - Fores[redacted]ce — FINE-LOAMY [illegible] CALCIAQUOLL

UTM 4[redacted]314

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location
6	FINE-LOAMY COLLOARY / CALCIAQUOLL (mixed, superactive, frigid)	9-12-06	BC	2 PITS	1-4 R 9B	ALTON	Sec. T. R

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW MINE YEAR 1	3 MI SE ALTON PRIVATE LAND		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM	TROPIC + MIXED SEDS	68	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock
BASIN - FANSCAPE	1	CONCAVE	75	190	SPD	a. CR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASSY MEDOW W/ SAGE + RABBIT BRUSH	15-17"		57" 56 (1 wk later)

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR Moist (1)	COLOR Dry (2)	Mottling (3)	TEXTURE (LAB) (d)	%C	STRUCTURE (e)	CONSISTENCE Dry (1)	Moist (2)	Wet (3)	Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB/FIELD pH (i)	BOUNDARY (j)
Ag	0-6	2.5Y 4/1	2.5Y 4/2	~~SE~~	Si Loam	24 22	1 M GR	SO	FR	SS PS	/	CR - 0 CB - 0 ST - 0	3c 2VF 2M 2F	3VF tu	SE	8.0	CS
Ag ABg	6-17	2.5Y 4/2	2.5Y 5/2	Few ~~calc~~ roots	Sandy clay SiCL	23 27	2M-C GR	SH	FI	SS PS	/	CR - 0 CB - 0 ST - 0	3M 2F 2VF	2VF TU	SE	8.2	AS
ACg	14-28	2.5Y 4/1	2.5Y 6/2	Common prominent	Sandy loam SiCL	14	2M-F SBK	HA	FI	SS/PS	/	CR - 0 CB - 0 ST - 0	1VF 1F,M	2VF TU	SE	8.5	AS
Cg2	28-48	2.5Y 5/3	2.5Y 7/2	Many prominent	Sandy loam SiC	16	WET	HA	FI	SS/PS	/	CR - 0 CB - 0 ST - 0	1F,M	1VF TU	NE	8.3	AS
Cg3				Many prominent			WET		-			CR - 0 CB - 0 ST - 0	1VF		NE		AS
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %: lab 16%	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
28. Diagnostic Horizons	a. Surface:	b. Subsurface: calcic		29. Moist Control Section Depth:

USDA - Forest Service

SOIL DESCRIPTION

(Refe [redacted] SH 2509.18) 5 (k)

Aridic ~~Typic~~ Calcixeroll

UTM 0310865 4139873 [redacted]

1. Map Unit [redacted]	2. Family or Series	3. Date [redacted] By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
4	fine-loamy, mixed (orthopluvial) ~~Superactive~~ Fine-silty MX, super, mesic	9/18/06 BC	18- P	1YR-10	Alton	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
YR 1 coalmine			Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium + Colluvium	Mixed Sedimentary		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock
Fanslope	4	convex	120'		WD	a. CR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Juniper - Pinyon W/ Big Sagebrush	15-17"		>

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR Moist (1)	COLOR Dry (2)	Mottling (3)	(LAB) TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-2" / 0-7	Chemical 10YR 3/3; 10YR 3/3	Crust 10YR 6/3; 10YR 5/3	/	SL (Loam)	26	2M-FPL 2M-F GR	SO	VFR	S/P	/	CR - 0 CB - 0 ST - 0	3VF 2F 1M-C	3VF IN	SE	7.8	C, S
Bk	7-13	10YR 4/3	10YR 5/2	/	(Loam) SIL (Loam)	26	2M-C SBK	SO	FR	S/P	1MNPF	CR - 0 CB - 0 ST - 0	3VF 2F 1M,C	2VF IN 1F TU	SE	7.7	C, S
Bk2 ~~Bt~~	13-26	10YR 4/3	10YR 6/3	/	SIC 34	23	1M-C SBK	SH	FR	SS/PS	1NPF 2MKPO	CR - 0 CB - 0 ST - 0	2VF 1F	2VF IN 1F TU	ST	7.9	C, W
Bk	26-44	10YR 5/3; 10YR 5/6	10YR 7/3 (TS); 10YR 7/6 (ZS)	/	(Clay Loam) SIL 34	28	2M-C SBK	HA	FI	SS/PS	/	CR - 0 CB - 0 ST - 0	1VF	1VF-F TU	ST	8.3	G, S
Bk2 ~~2C~~	44-68	10YR 5/3; 10YR 5/6	10YR 7/3; 10YR 7/4	?	(Silty Clay) SIL 32	26	MASSIVE LAMINAR	VH	FI	SS/PS	/	CR - 0 CB - 0 ST - 0	1VF	1VF-F TU	ST	8.5	G. S
2Ck 2C	68-84	10YR 5/4; 10YR 6/8	10YR 7/3; 10YR 7/6	Moist silt laterals	(Sandy Loam) 10	7	MASSIVE LAMINAR	SO	VFR	SO/PO	/	CR - 0 CB - 0 ST - 0	/	1VF TU	ST	8.4	
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	27	0	> 8 Feet

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	~~Ochric~~ Mollic	~~Argillic~~ Cambic, Calcic	10-30"

Previous edition ... lete.

FS 2500-1 (2/86)

UTM 41[illegible]

SOIL DESCRIPTION

(Refe[illegible] SII 2509.18)

USDA - Fore[illegible]ce

Aridic Calciustoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T R
4	Co-Loamy ~~Typic~~ Haplosteps ~~Haploboroll~~	9/13/04	BC	PIT 22-23 LANDSCAPE	1YR-11	ALTON	

9. Area: COAL HOLLOW SURVEY
10. Forest: mixed, superactive, mesic
11. Ranger District: 24
12. State: UTAH
13. County: KANE
14. Parent Material: ALLUVIUM / RESIDUUM?
15. Bedrock Name: ALLUVIUM / DAKOTA FM
16. Elevation:
17. Erosion: a. Kind: NONE b. Class:
18. Landform: ALLUVIAL FAN
19. Slope: a. % 4 b. Shape SL CONVEX c. Length 100' d. Aspect 280°
20. Drainage Class: MWD - WD
21. Surface Stone and Rock: a. CR 2 b. CB TR c. ST 0 d. BY 0
22. Potential Natural Vegetation: BIG SAGEBRUSH - JUNIPER -
23. Annual Precipitation: 15-17"
24. Measured Soil Temperature:
25. Water Table (Depth): > 8 1/2 FEET

HORIZON DESIGNATION (a)	DEPTH (INCHES) (b)	COLOR (c) Moist (1)	COLOR Dry (2)	Mottling (3)	(LAB) TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	(LAB) FIELD pH (i)	BOUNDARY (j)
A11	0-5	10YR 3/2	10YR 5/2	/	SL	9 / 12	1 M-PL → 1 F GR	LO	FR	SO/PO	/	CR-2 CB-2 ST-0	2F-M 1VF	3VF IN	NE	8.0	C,W
A12	5-16	10YR 3/3	10YR 5/3	/	SANDY LOAM FSL	14 / 15	1F SBK → 1M GR	SO	FR	SO/PO	/	CR-1 CB-0 ST-2	2F 1M,VF	2VF IN 2F TU	NE	8.2	G,W
Bwk	16-32	10YR 4/3	10YR 6/3	/	SANDY LOAM	10	2M-F SBK	SH	FI	SO/PO	/	CR-2 CB-0 ST-0	1VF-F	2VF, 1F TU	SE	8.3	G,W
Bwk	32-48	10YR 5/3	10YR 6/3	/	LOAMY SAND	8	MASSIVE	HA	FI	SS/PO	/	CR-0 CB-0 ST-0	1VF	2VF, 1F TU	SE	8.3	G,W
Bk	48-72	10YR 4/4	10YR 6/4	/	LOAMY SAND	8	MASSIVE	HA	FI	SS/PO	/	CR-3 CB-1 ST-0	1VF	2VF TU	ST	8.6	C,S
C	72-90	10YR 5/4	10YR 7/4	/	SAND	4	MASSIVE	SH	FI	SS/PO	/	CR-4 CB-1 ST-0	1VF	3VF IN	ST	8.7	
												CR- CB- ST-					
												CR- CB- ST-					
												CR- CH- ST-					

26. Particle Size Control Section: a. Depth: 10-40" b. Average Clay %: 13 c. Average Rock Fragment Content: 2
27. Depth to Lithic or Paralithic Contact: > 90"
28. Diagnostic Horizons: a. Surface: MOLLIC b. Subsurface: CAMBIC, CALCIC
29. Moist Control Section Depth: 10-30"

USDA - Forest Service

SOIL DESCRIPTION
(Ref. FSH 2509.18) 63-64(K)

UTM [redacted]

1. Map Uni[redacted]d	2. Family or Series	3. Da[redacted]	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
23	FINE, ~~SMECTITIC~~, Typic USTORTHENT mixed, superactive, MODERATELY DEEP mesic	9-19-06	BC	21 (P)	14R-12	ADAM	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
MINE YEAR 1 COAL HOLLOW SOIL SURVEY			UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
RESIDUUM / COLLUVIUM	DAKOTA SS w/ TROPIC SHALE		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
KNOLL, ERODED	8	~~CONVEX~~ STRAIGHT	75'	90°	WD	2	2	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
LOW SAGEBRUSH w/ DWARF UTAH JUNIPER + GRASSES			~~NONE~~ TO 4½ FEET

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	LAB TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-5	10YR 3/3	10YR 5/3	/	CLAY LOAM 22	1MPL → FGR	SO	FR	S/P	/	GR - 0, CB - 0, ST - 0	2VF-F 2M 1C	3VF IV 1VF TV	NE → SE	7.8	CS
Bw	5-10	10YR 4/3	10YR 6/3	/	SILTY LOAM SICL 32	3M-F ABK	HA	FI	VS/VP	/	GR - 5, CB - 3, ST - 0	2VF-F 1M 1C	2VF 1F TV	SE	7.8	GW
Bk	10-26	2.5Y 5/3	2.5Y 7/2	/	SILTY CLAY SICL 44	3M-C ABK	EH	EF	VS/VP	/	GR - 0, CB - 5, ST - 10	1VF-F	2VF TV	SE	8.4	GW
Cr	26-44	TROPIC SHALE BEDROCK		/	SICL	3 C PR MASSIVE	EH	EF	VS/VP	/	GR - 0, CB - 0, ST - 10	1VF	1VF TV	SE	8.3	CS

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-26"	37	11	26"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	/ calcic	10-26"

based on lab data

Previous edition ... lete.

FS 2500 (2/06)

USDA - Forest Service Aridic (Refe[redacted] FSH 2509.18) 56-57(ae) WTM 4139915

1. Map Unit [redacted]d 3	2. Family or Series mixed, super mesic Fi-Loamy ~~Mesic~~ Ustifluvent	3. Dat[redacted] 9-18-0[redacted]	4. By BC	5. Photo No. 47 (P)	6. Stop No. BR-13	7. USGS Quad ALTON	8. Location: Sec. ___ T. [redacted] R. ___	
9. Area SETTLING POND YEAR 1 MINE	10. Forest		11. Ranger District			12. State UT	13. County KANE	
14. Parent Material ALLUVIUM	15. Bedrock Name MIXED SEDIMENTARY		16. Elevation 68	17. Erosion: a. Kind NONE	b. Class			
18. Landform FANSLOPE	19. Slope: a. % 2 b. Shape CONCAVE c. Length 125 d. Aspect 270		20. Drainage Class WD	21. Surface Stone and Rock a. GR 0 b. CB 0 c. ST 0 d. BY 0				
22. Potential Natural Vegetation BIG SAGEBRUSH - RABBITBRUSH		23. Annual Precipitation 15-17		24. Measured Soil Temperature		25. Water Table (Depth) NONE TO 8 Ft		

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 4/3	10YR 5/3	/	SANDY LOAM	21	2M-F GR	SO	VFR	SO/PO	/	GR-0 CB-0 ST-0	3VF 2F 1M	3VF IN 1F TU	SE	8.5	A.S
AC	6-12	10YR 5/3 10YR 6/6	10YR 6/3 (80) 10YR 6/4 (20)	/	SILT LOAM	26	2M-F SBK	SH	FI	SS/PO	/	GR-0 CB-0 ST-0	3VF 2F 1M	2VF IN 2F-M TU	SE	8.2	A.S
2C2	12-24	10YR 5/3 10YR 5/6	10YR 6/3 (85) 10YR 6/6 (15)	/	SILTY CLAY	42	3F SBK	HA		S/P	/	GR-0 CB-0 ST-0	2VF 1F 1M	1VF-F-M TU	ST	8.4	A.S
2C3	24-48	7.5YR 5/4 7.5YR 5/8	10YR 7/3 (75) 7.5YR 6/8 (25)	/	CLAY LOAM SICL	32	2M-CPR 2ABK	VH		S/P	/	GR-0 CB-0 ST-0	1F 1VF	1F-M TU	ST	8.5	A.S
2C4 3C4	48-60	7.5YR 5/3 7.5YR 5/4	10YR 6/4 (75) 7.5YR 6/4 (25)	/	CLAY LOAM SIC	28	2M-C ABK	VH		S/P	/	GR-0 CB-0 ST-0	1VF	1VF-F TU	ST	8.8	A.S
4C5	60-72	10YR 4/3 10YR 4/6	10YR 5/4 (80) 10YR 5/6 (20)	/	SANDY CLAY	24	MASSIVE	VH		S/P	/	GR-0 CB-0 ST-0	/	1VF-F TU	ST	8.9	A.S
C6	72-84 84+	10YR 5/3 10YR 5/6	10YR 7/3 (60) 10YR 6/6 (40)	/	LOAM	20	MASSIVE	SO	FR	SO/PO	/	GR-0 CB-0 ST-0	/	2VF IN	ST	8.7	
												GR- CB- ST-					
												GR- CB- ST-					

26. Partical Size Control Section	a. Depth: 10-40"	b. Average Clay %: 33	c. Average Rock Fragment Content: 0	27. Depth to Lithic or Paralithic Contact: > 8 FEET
28. Diagnostic Horizons	a. Surface: OCHRIC	b. Subsurface: —		29. Moist Control Section Depth: 10-30'

SOIL DESCRIPTION

(Refer[redacted] SH 2509.18)

UTM 4139772 [redacted]

USDA - Forest [redacted]

1. Map Unit Symbol: 6
2. Family or Series: ~~Aquic Ustifluvent~~ ~~Aquoll~~ FI-LOAMY
3. Date: 9-13-00 [redacted]. By: BC
5. Photo No.: PEY 25-27
6. Stop No.: SP14
7. USGS Quad: ALTON
8. Location: Sec ___ T. [redacted] R. ___
9. Area: COAL HOLLOW
10. Forest: mixed, super, frigid
11. Ranger District:
12. State: UT
13. County: KANE
14. Parent Material: ALLUVIUM
15. Bedrock Name: ALLUVIUM / RESIDUUM
16. Elevation:
17. Erosion: a. Kind: NONE b. Class:
18. Landform: BASIN
19. Slope: a. % 1 b. Shape CONCAVE c. Length 100' d. Aspect 350°
20. Drainage Class: SPD
21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0
22. Potential Natural Vegetation: GRASS + SEDGES
23. Annual Precipitation: 15-17"
24. Measured Soil Temperature:
25. Water Table (Depth): 90-100"

HORIZON DESIGNATION (a)	(INCHES) DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	LAB TEXTURE (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	WB! FIELD pH (i)	BOUNDARY (j)
A1	0-6	10YR 3/2	10YR 5/3	NO	SILTY CLAY	44	2M-F GR	SO	FR	SS/P	/	CR - 0 CB - 0 ST - 0	3VF 3F 1M	3VF IN	NE	8.7	C, S
Bw A2	6-13	7.5YR 4/4	7.5YR 5/4	NO	SILTY CLAY	44	1F SBK	VH	VFI	SS/P	/	CR - 0 CB - 0 ST - 0	2VF 2F 1M	2VF TU	SE	7.8	C, W
2Bwk 2C1	13-28	10YR 6/4	10YR 7/3	begin at 24"	CLAY LOAM SICL	37	2M-F SBK	HA	FI	SS/PS	/	CR - 0 CB - 0 ST - 0	1VF	1VF TU	SE	8.1	G, W
2Bwk 2C2	28-48	10YR 7/2	10YR 6/3	YES	LOAM	17	2F SBK	HA	VFI	SO/PO	/	CR - 0 CB - 0 ST - 2	1VF	1VF TU	ES	8.7	G, S
3Cg 1	48-70	10YR 5/3 10YR 6/6	10YR 7/2 (69) 10YR 7/6 (40)	FAINT INDISTINCT YES	CLAY SILOAM	39	MASSIVE	HA	VFI	SO/PO	/	CR - 0 CB - 0 ST - 0	/	1VF - 1F TU	ES	8.8	A, S
3Cg 2	70-90	10YR 5/4	10YR 6/3	MANY PROMINENT YES 10YR 6/8	SICLAY LOAM	32	MASSIVE	VH	VFI	S/P	/	CR - 4 CB - 0 ST - 0	/	1VF TU	SE	8.5	
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CH ST -					

26. Partical Size Control Section: a. Depth: 10-40" b. Average Clay %: 24" c. Average Rock Fragment Content: 3

27. Depth to Lithic or Paralithic Contact: > 90"

28. Diagnostic Horizons: a. Surface: MOLLIC b. Subsurface: —

29. Moist Control Section Depth: 10-30"

lab data shows calcic

USDA - Forest Service

6 [redacted] RES COARSE-LOAMY ~~FLUVENTIC~~ HAPLOSTOLL (Reference [redacted] FSH 2509.18) 6162 (W) 1 UTM [redacted]

1. Map Unit [redacted]	2. Family or Series	3. Date [redacted]	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
6	mix, super, mesic ~~FLUVENTIC~~ HAPLOSTOLL	9-1[redacted]	BC	21 P	SP-15	ALTON	Sec. ____ T. [redacted] R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
SETTLING PONDS COAL HOLLOW SOIL SURVEY			UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM / RESIDUUM	MIXED SEDIMENTARY		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock
BASIN	2	CONCAVE	75'	260°	WD	a. CR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASS - SEDGES w/ LOW SAGEBRUSH	15-17 INCHES		NONE TO 8½ FEET

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
OE	1-0	DENSE ROOT	MAT									GR - CB - ST -			NE		A, S
A	0-8	10YR 3/3	10YR 5/3	/	SILT ~~LOAM~~ SANDY LOAM	16 21	2M-C GR	SO	FR	SS/PO	/	GR-0 CB-0 ST-0	3VF 3F, M	2VF 1N	SE/NE	8.0	A, S
BW	8-20	10YR 4/4	10YR 6/3	/	SIL LOAM	18 26	2M-F SBK	HA	FI	S/P	/	GR-0 CB-0 ST-0	2VF-F 1M	3VF IN 2F TU	NE → SE	8.5	A, W
BK1	20-37	10YR 5/3 10YR 5/6	10YR 7/3 10YR 7/4	/	FSL → SIL LOAM	15 26	3M-C SBK	VH	VFI	S/P	/	GR-0 CB-0 ST-0	2VF 1F, M	1VF-1F TU	SE	8.7	A, S
BW2	37-58	10YR 5/4	10YR 7/3	ORGANIC MATTER	LOAM SIL	18 23	2M-C SBK	SH	FI	S/P	/	GR-0 CB-0 ST-0	1VF-1F	1VF-TU	SE	8.6	A, W
C	58-73	10YR 5/4 10YR 5/8	10YR 6/4 10YR 6/6	COMMON PROMINENT	SL	8 15	MASSIVE	SO	VFR	SO/PO	/	GR-0 CB-0 ST-0	1VF 1F	/	NE	8.4	A S
CK2	73-~~96~~	10YR 5/4 10YR 5/8	10YR 7/3 10YR 7/6	COMMON PROMINENT	SL	14	MASSIVE	SO	FR	SO/PO	/	GR-0 CB-0 ST-0	/	/	NE	8.3	
												GR - CB - ST -					
												GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	16	0	> 9 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	CAMBIC CALCIC	10-30"

FS-2500-1 (2/86)

Previous edition obsolete.

USDA - Forest [redacted]

SOIL DESCRIPTION

Aridic ~~Fine Calciaquoll~~ FINE-LOAMY (Reference [redacted] SH 2509.18) 59-60K

1. Map Unit S[redacted]	2. Family or Series	3. Date [redacted] By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
6	mixed, super, mesic ~~Fine-silty~~ (or FI-LO) ~~Haploaquoll~~	9-19-06 BC	20-P	SP-16	ALTON	Sec. ____ T. [redacted] R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
SETTLING PONDS COAL HOLLOW			UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind / b. Class
ALLUVIUM / RESIDUUM	ALLUVIUM MIXED SEDIMENTARY		a. Kind NONE b. Class

18. Landform	19. Slope:	20. Drainage Class	21. Surface Stone and Rock
BASIN	a. % 1-2 b. Shape CONCAVE c. Length 160' d. Aspect 310	WD	a. CR 2 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASS + SEDGES	5-17"		> 8 FEET

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	LAB TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
Oe	1½-0	DENSE ROOT MAT.									/	CR-0 CB-0 ST-0			NE		A.W
A1	0-8	10YR 3/2	10YR 4/2		SILTY CLAY LOAM	36	3M-F GR	SO	FR	S/P	/	GR-0 CB-0 ST-0	3VF 3F 3M	3VF 3F 3M	NE	8.3	C.S
Bw ~~A2~~	8-18	7.5YR 5/6	10YR 6/3	/	SILT 44 CLAY	28	2F SBK → <gr	SH	FR	S/P	/	GR-0 CB-0 ST-0	2VF-F 2M 1C	2VF-F 2M 1C	NE	8.2	C.S
Bk1	18-36	7.5YR 5/4	7.5YR 7/3	/	CLAY LOAM SIL 28	27	3M-F ABK	VH	VFI	S/P		GR-0 CB-0 ST-0	2VF 2F	2VF 2F	SE	8.7	A.S
Bk2	36-56	7.5YR 5/4	7.5YR 7/4	FEW FAINT 7.5YR 5/6	SILTY CLAY SIL 28	29	2M-C SBK	HA	FI	S/P	/	GR-0 CB-0 ST-0	2F 1VF	2VF 1VF	SE	9.0	A.S
2Cy1	56-68	7.5YR 5/4 7.5YR 5/6	7.5YR 7/3 7.5YR 7/4	FEW FAINT 7.5YR 4/6	LOAM SIL 14	27	MASSIVE	HA	FI	S/P	/	GR-0 CB-0 ST-0	1VF-F	1VF-F	SE → NE	8.9	A.S
2Cy2	68-96	2.5Y 5/2	2.5Y 6/2	COMMON PROMINENT 5YR 5/6	SCL → SIL 28 CLAY LOAM	30	MASSIVE	HA	VFI	SS/PS	/	GR-0 CB-0 ST-0	1F 1VF	1F 1VF	NE	8.9	
												GR- CB- ST-					
												GR- CB- ST-					

26. Partical Size Control Section — a. Depth: 10-40" — b. Average Clay %: 31 — c. Average Rock Fragment Content: 0

27. Depth to Lithic or Paralithic Contact: > 8 FEET

28. Diagnostic Horizons — a. Surface: MOLLIC — b. Subsurface: CAMBIC

29. Moist Control Section Depth: 10-30"

FS 2500-1 (2/86)

Previous edition ... Note: does not make Aquic Calciustoll because mottles are deeper than 30"

USDA - Forest [redacted]rvice

SOIL DESCRIPTION

(Refer[redacted] FSH 2509.18)16-17(P)

Aridic ~~Typic~~ Calcixstoll

UTM 41404[redacted]

1. Map Unit [redacted]	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
4 7B	Fine-Loamy ~~Arg~~ Calcixstoll	9-18-06 [redacted]	BC	53-54	WRD-17	Acton	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
Waste Rockdump Coal Hollow Survey	2½ mi. SE of Alton		Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind / b. Class
Alluvium + Colluvium	Mixed Sedimentary		a. Kind None; b. Class

18. Landform	19. Slope	20. Drainage Class	21. Surface Stone and Rock
Fanslope -	a. % 3 b. Shape Planar c. Length 200' d. Aspect 210°	WD	a. CR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Wyo Big Sagebrush - Rabbitbrush w/ P.J.	15-17"		None to

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR Moist (1)	COLOR Dry (2)	Mottling (3)	(LAB) TEXTURE (4)	STRUCTURE (e)	CONSISTENCE Dry (1)	Moist (2)	Wet (3)	Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-9	10YR 3/4	10YR 5/3	/	Clay Loam / SiCL 36 28	3 m-cpl → FGR	SO	FR	S/P	/	CR - 1, CB - , ST - 0	3VF 2F,M 1C	3VF, M 1F TU	SE	7.8	C,S
BW ~~Bt~~	9-18	10YR 4/3	10YR 6/3	/	Clay Loam / SiCL 32 30	2M-F ABK	VH	VF	S/P	2MK PF, 1NPO	CR - 2, CB - 0, ST - 0	2VF 1F 1M 1C	1VF-F TU	SE	8.0	C,S
Bk ~~Bt~~	18-30	10YR 4/3, 10YR 5/8	10YR 6/4 (70), 10YR 6/6 (30)	/	Loam or SiCL 22	3M-F ABK	VH	VFI	S/P	2MNPF ~~1NPO~~	CR - 2, CB - 0, ST - 0	1VF 1F,M	1VF-F TU	ST	8.0	GW
~~Bk2~~ Btk	30-45	10YR 4/4	10YR 6/3		Clay Loam ~~SiCL~~ 27	3M-F ABK	VHA	VFI	S/P	2NPO 1NPF	CR - 2, CB - 0, ST - 0	1F, VF	1F-M TU	ST	8.1	G,W
Ck	45-60	10YR 5/4, 7.5YR 5/6	10YR 7/3, 7.5YR 6/6	Bias colors from	Clay Loam / SiCL 32	3M-C SBK	SH	FI	S/P	/	CR - 2, CB - 0, ST - 0	1VF	1VF-F TU	ST	8.2	G,W
Ck	60-80+	7.5YR 5/4, 7.5YR 5/6	10YR 7/4	LMS	Silty Clay 40						CR - 0, CB - 0, ST - 0	/	2VF-1F TU	ST	8.0	
											CR - , CB - , ST -					
											CR - , CB - , ST -					
											CR - , CB - , ST -					

Ck2 Ck1 Bk2 Bk1 Bw

26. Partical Size Control Section	a. Depth: 10-40"	b. Average Clay %: 26	c. Average Rock Fragment Content: 2	27. Depth to Lithic or Paralithic Contact: > 7 feet
28. Diagnostic Horizons	a. Surface: Mollic	b. Subsurface: ~~Argillic~~ + Calcic		29. Moist Control Section Depth: 10-30"

Previous edition ... ete. FS-2500-1 (2/06)

USDA - Fore[redacted]ice

SOIL [redacted]SCRIPTION
(N-[redacted] SH 2509.18)

UTM 0371878
414023D[redacted]

FINE-LOAMY Typic Argiusto

1. Map Unit Symbol: 67
2. Family or Series: mixed superactive frigid ~~FINE-LOAMY~~ TYPIC CALCI AQUOLL
3. Date: 9/14/06
4. By: BC
5. Photo. No.: 32-33(K)
6. Stop No.: WRO 48A
7. USGS Quad: ALTON
8. Location: Sec. ___ T. ___ R. ___
9. Area: COAL HOLLOW STUDY AREA
10. Forest: PRIVATE LANDS 2 MILE SE OF ALTON
11. Ranger District:
12. State: UTAH
13. County: KANE
14. Parent Material: ALLUVIUM / RESIDUUM
15. Bedrock Name: ALLUVIUM + TROPIC SHALE
16. Elevation:
17. Erosion: a. Kind NONE b. Class
18. Landform: FANSLOPE
19. Slope: a. % 4 b. Shape CONCAVE c. Length 250' d. Aspect 250°
20. Drainage Class: SPD
21. Surface Stone and Rock: a. GR 0 b. CB 0 c. ST 0 d. BY 0
22. Potential Natural Vegetation: GRASS + SEDGE FEW ARTR ROCKY MTN IRIS
23. Annual Precipitation: 15-17"
24. Measured Soil Temperature:
25. Water Table (Depth): 51" (53 IWK)

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d) (LDS)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-7	10YR 3/2	10YR 5/2	/	SIL LOAM	26	1FSBK → MG	SO	FR	SS/PS	/	GR - 0, CB - 0, ST - 0	3VF 3F 3M	3VF IN	SE	7.7	A, S
Bw	7-15	10YR 4/3	10YR 6/3	Common FAINT	SIL LOAM	24	2F+M SBK	SO	FR	SS/PS	/	GR - 0, CB - 0, ST - 0	2M-F 3VF	2VF-1F IN	SE	8.0	A, S
~~BK~~ Acg	15-30	2.5Y 5/3	2.5Y 7/3	Common FAINT	FSL SIL	17	2M-F SBK	SHA	FR	SS/PO	/	GR - 0, CB - 0, ST - 0	2M 1F 1VF	1VF TU	SE	8.1	A, S
~~BKg~~ Acg2	30-45	2.5Y 5/2	2.5Y 6/2	MANY PROMINENT	SILTY LOAM SIL	35	2FSBK → MGR	SH	FI	SS/PS	35 CLF PF	GR - 0, CB - 0, ST - 0	2M 1F 1VF	1VF TU	SE	8.0	A, W
~~Acg~~ A	45-60	5Y 5/2	5Y 6/2	GLEYED	SANDY CLAY SIL	20	MASSIVE	.			/	GR - 0, CB - 0, ST - 0	1M 1F	1F TU	UNDER WATER	7.9	A

26. Partical Size Control Section: a. Depth: 10-40" b. Average Clay %: 27 c. Average Rock Fragment Content: 0
27. Depth to Lithic or Paralithic Contact: >60"
28. Diagnostic Horizons: a. Surface: MOLLIC b. Subsurface: CALCIC
29. Moist Control Section Depth: 10-30

FS-2500-1 (2/86)

USDA - Fores[illegible]ce

Typic ~~Fluventic~~ ~~Haploxeroll~~ Argiaquoll

SOIL DESCRIPTION

(Refe[illegible]FSH 2509.18)

UTM 4140300

1. Map Unit Symbol: 4 #	2. Family or Series: Fi-loamy, mix, ~~Argic~~ Superr, frigid ? Calcixeroll	3. Date: 9-14-06	4. By: BC	5. Photo. No.: 34-35	6. Stop No.: WRO-18B	7. USGS Quad: ALTON	8. Location: Sec. ___ T. ___ R. ___
9. Area: Cool Hollow Soil Survey	10. Forest: Approx 2 mile SE of ALTON		11. Ranger District:			12. State: UT	13. County: KANE
14. Parent Material: Colluvium / Alluvium	15. Bedrock Name: Mixed sedimentary		16. Elevation:		17. Erosion: a. Kind: None b. Class:		
18. Landform: Alluvial fanslope	19. Slope: a. % 3 b. Shape: convex c. Length 150' d. Aspect 220°		20. Drainage Class: WD		21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0		
22. Potential Natural Vegetation: Wyo big sagebrush - rabbitbrush		23. Annual Precipitation: 15-17"		24. Measured Soil Temperature:		25. Water Table (Depth): >8 feet	

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	LAB TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB! FIELD pH (i)	BOUNDARY (j)
A	0-9	10YR 3/4	10YR 5/4	/	SiL Loam 26	2M-F SBK	SO	FR			CR-0 CB-0 ST-0	2M 2C 1VF, F	3VF IN	SE	8.2	C, S
Bt1 ~~Bw~~	9-19	10YR 4/3	10YR 6/3	/	Loam 20	2M-C SBK	SH	FI		/	CR-1 CB- ST-	1F, M 1VF, C	2VF-1F IN	SE	8.3	C, W
Btk1	19-34	10YR 5/4	10YR 7/3	/	Loam SiCL 18	2M-F SBK	VH	VFI	S/P	~~1 MKPF~~ 2 KPO	CR-2 CB- ST-	1VF, F	1VF-1F TU	SE	8.5	C, W
Btk2	34-54	10YR 5/4	10YR 6/3	/	CLAY LOAM SiC 32	2M-C ABK	VH	VFI	S/P	~~1 MKPF~~ ~~thpo~~	CR-2 CB- ST-	1VF	1VF TU	SE	8.7	G, W
Ck	54-72	10YR 4/4	10YR 6/4	/	CLAY LOAM SiL 34	MASSIVE	VH	VFI	S/P	/	CR-1 CB- ST-	V1VF	1VF TU	SE	8.6	G, W
C	72-96	10YR 5/4	10YR 6/3	/	Loam 20	MASSIVE	EH	~~EFI~~ VFI	S/P	/	CR-1 CB- ST-	/	2VF TU	VS	8.6	
											CR- CB- ST-	/		~~VS~~		
											CR- CB- ST-					
											CR- CH- ST-					

26. Particle Size Control Section	a. Depth: 10-40"	b. Average Clay %: 25	c. Average Rock Fragment Content: 0	27. Depth to Lithic or Paralithic Contact: > 8 feet
28. Diagnostic Horizons	a. Surface: Mollic		b. Subsurface: ~~Argillic~~ / Calcic	29. Moist Control Section Depth: 10-30

USDA - Forest [redacted] ice — SOIL DESCRIPTION (Reference [redacted] FSH 2509.18) PHOTOS 39-40-41 UTM 4130048

TYPIC ARGIUSTOLL

1. Map Unit S[redacted]: 4 ~~7~~
2. Family or Series: mixed, superactive, mesic Fi-Loamy ~~Fine~~ ~~[illegible]~~
3. Dat[redacted]: 9-14-06
4. By: BC
5. Photo. No.: 39, 40 ↗
6. Stop No.: WRD-19
7. USGS Quad: ALTON
8. Location: Sec. ___ T [redacted] R. ___
9. Area: COAL HOLLOW SOIL SURVEY
10. Forest: WEATHER STATION TO EAST & 9/17/06
11. Ranger District:
12. State: UT
13. County: KANE
14. Parent Material: COLLUVIUM / RESIDUUM
15. Bedrock Name: DAKOTA FORMATION
16. Elevation: 700
17. Erosion: a. Kind: NONE b. Class:
18. Landform: FANSLOPE
19. Slope: a. % 5 b. Shape CONVEX c. Length 250' d. Aspect 260°
20. Drainage Class: WD → SPD
21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0
22. Potential Natural Vegetation: BIG SAGEBRUSH - RABBITBRUSH SCATTERED JUNIPER
23. Annual Precipitation: 15-17"
24. Measured Soil Temperature:
25. Water Table (Depth): NONE

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	Mottling (3)	LAB TEXTURE (d)	% C.	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB! FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 3/2	10YR 5/2	/	LOAM SiL 124	27	2M GR	SO	FR	SS/PS	/	CR-0 CB-0 ST-0	3VF 1F,M 1C	3VF 1I	SE	8.0	C,S
Bt1	6-12	10YR 4/2	10YR 5/3	/	CLAY LOAM SCL 32	29	2M-F SBK	HA	FI	SS/PS	1 n PO	CR-0 CB-0 ST-0	1VF-F	1VF-1F TU	SE	8.3	C,W
Bt2	12-24	10YR 4/4	10YR 6/3	/	CLAY LOAM SCL 30	32	2F-M SBK	VH	VFI	S/P	2 MK PF 1 n PO	CR-0 CB-0 ST-0	1VF-F	1VF-1F TU	4VF CAM SE	8.3	C,W
Bt3	24-37	10YR 4/3	10YR 6/3	/	LOAM CL 32	34	3F-M SBK	HA	VFI	S/P	1 n PF/PO	CR-0 CB-0 ST-0	1F	1VF-1F TU	8F CAM SE	8.5	C,W
Bk1 g	37-51	10YR 4/4	10YR 6/4	/	FINE SL 14	17	2M-C SBK	HA	VFI	SS/PO	/	CR-0 CB-0 ST-0	1F, 1M	1VF TU	ST SE 4F CAM	8.4	C,S
Bk2 g	51-68	10YR 5/4	10YR 6/3	/	SANDY LOAM 12	17	MA	HA	FI	SO/PO	/	CR-0 CB-0 ST-0	1F, 1M	2VF 1F TU	SE 6F CAM	8.5	C,W
Bk3 g	68-90	10YR 5/4	7.5YR 6/4		SANDY LOAM	10	MA	LO	LO	SO/PO	/	CR- CB- ST-	/	3VF 1N	ST 6F CAM	8.7	
												CR- CB- ST-					
												CR- CB- ST-					

26. Particle Size Control Section: a. Depth: 12-32" b. Average Clay %: 31 c. Average Rock Fragment Content: 0
27. Depth to Lithic or Paralithic Contact: > 6 FEET
28. Diagnostic Horizons: a. Surface: MOLLIC b. Subsurface: ARGILLIC
29. Moist Control Section Depth: 10-30"

FS-2500-1 (7/06)

USDA - Forest [redacted]

SOIL DESCRIPTION

(Refer [redacted] 2509.18) 44-46 K

Aridic
Mollic Ustifluvent

UTM [redacted]

1. Map Unit Sy[redacted]	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location
8	co-loamy, mix, superact, mesic ~~Fluventic~~ Haploxerolls	4-17-06	BC	6-7 (P)	WGD 20	A	Sec. T. R

9. Area: COAL HOLLOW SD
10. Forest:
11. Ranger District:
12. State: UT
13. County:
14. Parent Material: Colluvium
15. Bedrock Name: SEDIMENTARY
16. Elevation: 70
17. Erosion a. Kind: NONE b. Class
18. Landform: FANSLOPE
19. Slope: a. % 3 b. Shape CONVEX c. Length 75 d. Aspect 190
20. Drainage Class: WD
21. Surface Stone and Rock a. GR b. CB c. ST 0 d. BY 0
22. Potential Natural Vegetation: OAK - SNOWBERRY w/ JUNIPER
23. Annual Precipitation: 17-19
24. Measured Soil Temperature:
25. Water Table (Depth): > 5 FT

HORIZON DESIGNATION (a)	DEPTH (INCHES) (b)	COLOR Moist (1)	COLOR Dry (2)	Mottling (3)	LAB TEXTURE (d)	STRUCTURE (e)	CONSISTENCE Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 3/3	10YR 5/3	/	LOAM 24	2M-F GR	SO	FR	SS PS		GR CB ST	3F 2F 2M	3VF-N	SE	7.9	C, S
BW	6-13	10YR 4/4	10YR 6/4	/	SICL 30 CLAY LOAM 22	2M-F SBK	HA	FI	SS PS	/	GR CB ST 0	2M-C 2F 1VF	2VF-1F TU	SE	7.8	C, S
BK	13-28	10YR 5/4	10YR 6/3	/	SANDY LOAM 10 17	3M-C SBK	VH	FI	SO PO	/	GR CB ST	2M-C 1F	1VF-1F TU	ST	8.1	A, S
CK 2C	28-54	10YR 5/4	10YR 7/4	/	LOAMY SAND LS 7 12	1CSBK → SG	SO	VFR	SO PO	—	GR 10 CB 3 ST	2VF 1F, M 1C	1VF TU	ST	8.0	A, S
3C1	54-72	7.5YR 5/6	7.5YR 6/4	/	LOAM CL 26 31	MASSIVE	SH	FI	SS PS	/	GR 0 CB ST	1F-M	1VF-1F TU	ST	8.1	C, W
OE	3-1½	OAK LEAVES TWIGS, BRANCHES									GR CB ST					
O1	1½-0	SLIGHTLY DECOMPOSED FOREST LITTER									GR CB ST					
3C2	72-96	10YR 4/3	10YR 6/3	/	LOAMY SAND 5	MASSIVE	LO	LO	SO/PO	/	GR CB ST	1VF	1VF IN	SE	8.2	
											GR CB ST					

26. Partical Size Control Section: a. Depth: 10-40" b. Average Clay %: 13 c. Average Rock Fragment Content: 0-2%
27. Depth to Lithic or Paralithic Contact: > 96 INCHES
28. Diagnostic Horizons: a. Surface: OCHRIC b. Subsurface: ~~ARGILLIC~~ CALCIC
29. Moist Control Section Depth: 10-30"

FS 2500-1 (2/86)

Previous edition [illegible]

+ LENSE OF GRAVELLY ALLUVIUM 35-40"

USDA - Forest [redacted] SOIL DESCRIPTION (Refer [redacted] 2509.18) 47-48(K) 4140354

1. Map Unit Symbol: 8	2. Family or Series: COARSE-LOAMY ~~MOLLIC~~ Arizic USTIFLUVENT MIX, SUPER, MESIC ~~Frisbenny~~ ~~Harvestreef~~	3. Date [redacted] 9-18-06	By BC	5. Photo No. 8-9 (P)	6. Stop No. WRD-21	7. USGS Quad ALTON	8. Location: Sec. ___ T. [redacted] R. ___
9. Area: WASTE ROCK DUMP	10. Forest		11. Ranger District			12. State UT	13. County KANE
14. Parent Material: ALLUVIUM	15. Bedrock Name: MIXED SEDIMENTARY		16. Elevation: 7D	17. Erosion: a. Kind NONE b. Class			
18. Landform: FANSLOPE	19. Slope: a. % 2 b. Shape PLANAR c. Length 100' d. Aspect 191°		20. Drainage Class: WD	21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0			
22. Potential Natural Vegetation: BIG SAGEBRUSH OPENING IN OAK GROVE		23. Annual Precipitation: 17-18"		24. Measured Soil Temperature		25. Water Table (Depth): NONE	

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	LAB TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-8	7.5YR 4/4	7.5YR 6/4	/	SANDY CLAY LOAM 19	2MC SBK→PL	SO	VFR	SO PO	/	CR-0 CB-0 ST-0	3VF 2F,M 1C	2VF-2F 1M	VS→ EO	8.4	C,S
Bw1	8-18	7.5YR 4/3	7.5YR 6/3	/	SANDY CLAY LOAM 28 SiCL	2M-F SBK	VHA	VFI	S PS	/	CR-0 CB-0 ST-0	2VF-F 1M,C	1VF-F, 1M TU	ST	8.1	C,W
Bw2	18-36	7.5YR 4/4	7.5YR 6/3	/	SANDY LOAM SCL 21	2M-F SBK	SH	FI	SS PS	/	CR-5 CB-1 ST-0	1M,F 2VF	1VF TU	ST	8.4	C,W
Bw3	36-50	7.5YR 5/4	7.5YR 6/3	/	SL 8 16	3 M-C SBK	SH	VFR	SO PO	/	CR-0 CB-T ST-0	1VF	1VF TU	SE	8.7	C,S
2C1	50-62	10YR 4/4	10YR 6/3	/	SL 8 14	MASSIVE	HA	FI	SO PO	/	CR-0 CB-0 ST-0	/	1VF-F TU	SE	8.7	C,S
2C2	62-96+	10YR 5/4	10YR 7/3	2 common DISTINCT 7.5YR 4/6	LSANDY LOAM 12 6	SG	LO	LO	SO PO	/	CR- CB- ST-	/	3VF 1F TU	SE	8.7	C,W
											CR- CB- ST-					
											CR- CH- ST-					
											CR- CH- ST-					

26. Partical Size Control Section	a. Depth: 8-18	b. Average Clay %: 15	c. Average Rock Fragment Content: 2	27. Depth to Lithic or Paralithic Contact: >8 FEET
28. Diagnostic Horizons	a. Surface: OCHRIC	b. Subsurface: ~~ARGILLIC~~ CAMBIC		29. Moist Control Section Depth: 10-30"

SOIL DESCRIPTION

(Refer... 11 2509.18)

WRD-22 UTM 4142382

USDA - Forest Service

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Map No.	7. USGS Quad	8. Location
8	mixed, super, mesic Fi-loamy Typic Haplustalf	9-14-06	BC	36-37	WRD-22	ALTON	Sec. T. R.

9. Area	10. Forest	11. Ranger District	12. State	13. County
Goat Hollow Soil Survey	2½ mi SE of Alton		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Colluvium over Residuum	Tropic / Dakota Residuum		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. CR	b. CB	c. ST	d. BY
Toeslope	8	Convex	75	220°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Oak, Snowberry, Grasses, Forbs			7 ft

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	Mottling (3)	LAB TEXTURE (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB! FIELD pH (i)	BOUNDARY (j)
Oe	7-4	Oak leaves, duff, twigs										CR - CB - ST -					
Oi	4-0	Partially decomposed oak leaf litter										CR - CB - ST -					A, S
A	0-6	10YR 5/4	10YR 6/3	/	Sandy clay SiL	14	2m-f SBK	SH	VFr	SO/PO	/	CR - 0 CB - 0 ST - 0	2m 2f 1vf	1vf-f in	SE	7.7	A, S
Bt1	6-15	10YR 4/3	10YR 6/4	/	Silty clay SiCL	34	2m-c SBK	HA	FI	S/P	1 mk pf	CR - 0 CB - 0 ST - 0	2m 2f 1c, 1vf	1vf-f tu	SE	7.7	C, S
Btk	15-28	10YR 4/4	10YR 6/4	Few faint root channels	Sandy clay SiCL	26	2m-f SBK	HA	FI	SS/PS	2 npo	CR - 0 CB - 0 ST - 0	1f 1m 1c	1vf tu	SE	8.0	C, S
Ck1	28-48	10YR 5/4	10YR 7/4	Few brown	Sandy loam	14	3m-c SBK	HA	FI	SO/PO	/	CR - 0 CB - 0 ST - 0	1f 1m 1c	1vf-f tu	SE	8.0	C, W
Ck2	48-60	10YR 5/4	10YR 6/3	C DM brown Prominent	Sandy loam	14	Massive	SH	FR	SO/PO	/	CR - 0 CB - 0 ST -	1m 1f 1c	2vf tu	SE	8.0	C, W
2C3	60-84	10YR 5/4	10YR 7/3	Many prominent	Sandy loam	8	Massive	SH	FR	SO/PO	/	CR - CB - ST -	1vf-f 1m, c	3vf in	SE	8.2	
												CR - CB - ST -					

26. Particle Size Control Section	a. Depth	b. Average Clay %	c. Average Rock Fragment Content	27. Depth to Lithic or Paralithic Contact
	6-28	25	0	84" +

28. Diagnostic Horizons	a. Surface	b. Subsurface	29. Moist Control Section Depth
	Ochric	Argillic	10-30"

FS-2500-1 (2/86)

SOIL DESCRIPTION

Aridic ~~Pale~~ Calciustoll (Refer... 11 2509.1B) 42, 43 Kodom JIM 41405

USDA - Forest ...

mix, super, mesic Argiustoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
#4	FINE-LOAMY	9.17	BC	~~45~~(P)	WRD-23	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW SOIL SURVEY	NE EDGE OF SURVEY AREA		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
SEDIMENTARY	MIXED COLLUVIUM		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock
FANSLOPE	3	CONCAVE	130	200°	WD	a. CR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH, SCATTERED JUNIPER, GRASSES	15-17"		NONE

HORIZON DESIGNATION (a)	DEPTH (b) INCHES	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d) (LAB)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i) (LAB)	BOUNDARY (j)
A	0-6	10YR 3/2	10YR 5/2	/	(SILT LOAM) SIL 31	2MGR	SO	FR	SO PO	/	CR- CB- ST- /	3VF 2F,M 1C	3VF 1N	SE	7.7	C,S
AB	6-12	10YR 4/3	10YR 6/4	/	SICL 31 27	3M-F SBK	HA	FI	S PS	/	CR- CB- ST- /	2VF 1F 1M,C	2VF 1N 1F TU	SE	7.9	C,W
Bk1	12-22	10YR 5/4	10YR 6/3	/	CLAY LOAM CL 28 30	2F SBK	HA	FI	S PS	/	CR- CB- ST- /	2VF 1F,M	3VF-1F TU	ST	7.9	C,S
Bk2	22-40	10YR 5/4	10YR 6/3	1 FAINT 10YR 4/6	LOAM SIL 19 20	2M-C SBK	HA	VFI	SS PO	/	CR- CB- ST- /	1VF- 1F	1VF-F TU	ST	8.0	C,W
Ck	40-62	7.5YR 5/4 7.5	10YR 7/4	7 FAINT 10YR 7/6	(LOAM) L 25 22	2M-C SBK	HA	VFI	SS PS	/	CR- CB- ST- /	/	2VF TU	ST	8.2	GW
2Ck	62-80	7.5YR 5/4 7.5YR 6/8	7.5YR 7/3 7.5YR 6/4	3 PROM. 7.5YR 7/4	SILTY CLAY 41	MASSIVE AUGERED	VH	VFI	S/P	/	CR- CB- ST-	/	2VF TU	ST	8.1	
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	6-22	28	0	> 8 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	ARGILLIC, CALCIC	10-30"

FS-2500-1 (2/86)

USDA - Fore… …ke | Aridic | SOIL DESCRIPTION (R-… FSH 2509.18) DAH-24 | UTM 4134699

1. Map Unit Symbol: ~~SA~~ 5	2. Family or Series: Fine ~~(calcareous)~~, Mixed, Superactive, mesic ~~Ustic~~	3. Date: 9-13-00	4. By: BC	5. Photo. No.: 28-29	6. Stop No.: DAH-24	7. USGS Quad: ALTON
8. Location: Sec. ___ T ___ R ___	12. State: UT	13. County: KANE				
9. Area: COAL HOLLOW SURVEY	10. Forest:	MODERATELY DEEP	11. Ranger District:			
14. Parent Material: COLLUVIUM / RESIDUUM	15. Bedrock Name: DAKOTA FM / OR TROPIC	16. Elevation: 68	17. Erosion: a. Kind: NONE b. Class:			
18. Landform: HILLSLOPE	19. Slope: a. % 13 b. Shape CONVEX c. Length 50' d. Aspect 20°	20. Drainage Class: PD	21. Surface Stone and Rock: a. CR 0 b. CB 0 c. ST 0 d. BY 0			
22. Potential Natural Vegetation: PINYON-JUNIPER W/ BLACK SAGEBRUSH	23. Annual Precipitation: 15-17"	24. Measured Soil Temperature:	25. Water Table (Depth): NONE			

HORIZON DESIGNATION (a)	DEPTH (INCHES) (b)	COLOR (c) Moist (1)	COLOR Dry (2)	Mottling (3)	LAB TEXTURE (d) %	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB! FIELD pH (i)	BOUNDARY (j)
A	0-5	2.5Y 4/2	2.5Y 4/3	/	CLAY 41	1FSBK → MGR	SO	VFR	S/VP	/	CR - 0, CB - 0, ST - 0	2VF 1F,M,C	2VF-1F 1M	NE	7.6	C,W
C1	5-17	2.5Y 4/3	2.5Y 4/2	/	CLAY 44	2M-F SBK	EH	EF	VS/VP	/	CR - / CB - / ST -	1VF 1F	1VF TU	NE	7.7	C,W
C2	17-32	5Y 5/3	5Y 5/4, 5Y 6/2	/	CLAY 45	3C-M ABK	EH	EF	VS/VP	/	CR - / CB - / ST -	1VF	1VF TU	NE	8.1	A,W
Cr	32-60	GREY SILTSTONE / SANDSTONE BEDROCK									CR - CB - ST -					

26. Particle Size Control Section	a. Depth: 10-32	b. Average Clay %: 50+	c. Average Rock Fragment Content: 0
27. Depth to Lithic or Paralithic Contact: 32" TO SOFT SHALE			
28. Diagnostic Horizons	a. Surface: OCHRIC	b. Subsurface: —	
29. Moist Control Section Depth: 10-32"			

SOIL DESCRIPTION (Ref. FSH 2509.18) Landscape 31 4139852

USDA - [redacted] fine mx super Aridic mesic Typic Ustorthents

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location
~~55~~ 5	~~CLAY SHALE~~ fine mx super Aridic mesic Typic Ustorthents	9-13-06 [redacted]	BC	J 30	DAH-25	ALTON	Sec. ___ T [redacted] R ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW SOIL SURVEY	MODERATELY DEEP		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
RESIDUUM	DAKOTA FM - HARD SANDSTONE	69	SLIGHT SHEET	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. CR	b. CB	c. ST	d. BY
HILLSIDE	19	CONVEX	50'	140°	SPD	20	15	2	TR

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
PINYON-JUNIPER WITH FEW SAGEBRUSH	15-17"		NONE

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	LAB TEXTURE (d) % Cl.	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
Oi	1/2-0	NEEDLES, DISCONTINUOUS		~~NONE~~		~~2F SBK~~	~~HA~~	~~FR~~	S/J	/	CR 25, CB 15, ST 0	1VF 4F 2MC		NE		
A	0-5	7.5YR 3/3, 7.5YR 4/4	7.5YR 5/2, 7.5YR 6/4	NONE	CLAY 40	2M-F SBK	HA	FI	S/P	/	CR 15, CB 15, ST 0	1F 1M 1C	2VF IN 1F TU	NE	6.4	C, S
C1	5-13	7.5YR 4/2	7.5YR 5/2	NONE	CLAY 47	2M SBK	HA	FI	VS/VP	/	CR 20, CB 10, ST 0	1NF, F 1M	1VF-F TU	NE	7.0	C, W
C2	13-20	10YR 3/4, 7.5YR 5/6	10YR 4/3	NONE	SANDY CLAY 46	2M SBK	HA	FI	VS/VP	/	CR 0, CB 10, ST 10	1VF	1VF TU	NE	7.2	G, W
C3	20-32	10YR 4/4	10YR 5/4	/	SANDY CLAY 33	3M-F ABK	VH	FI	VS/VP	/	CR -, CB -, ST -	1VF	2VF TU	SE	7.7	G, S
R	32+	HARD SANDSTONE BEDROCK									CR -, CB -, ST -					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-32"	45	>35%	32" HARD SANDSTONE

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	—	10-30"

Bk based on lab data; but no effervescence in box sample [illegible]

SOIL DESCRIPTION

USDA - Fore[redacted]ice — (Ref. FSH 2509.18) [redacted] 537545 4115892 [redacted]

1. Map Unit Symbol	2. Family or Series	3. Date [redacted] By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
~~SH~~ 1	FINE ~~SMECTITIC~~ mixed superactive frigid TYPIC ~~HAPLUSTOLL~~	[illegible]		26		

9. Area	10. Forest	11. Ranger District	12. State	13. County
[illegible]			UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind / b. Class
[illegible]	TROPIC SHALE		

18. Landform	19. Slope: a. % / b. Shape / c. Length / d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR / b. CB / c. ST / d. BY
[illegible]	a. % 3, b. Shape [illegible], c. Length 125, d. Aspect 260°	SPD	[illegible]

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
JUNIPER w/ SAGEBRUSH	15-16		[illegible]

Horizon (a)	Depth (b)	Color Moist (1)	Color Dry (2)	Mottling (3)	Texture (d)	Structure (e)	Consistence Dry (1)	Consistence Moist (2)	Consistence Wet (3)	Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	Effer. Class (h)	Field pH (i)	Boundary (j)
A	0-8	10YR 3/3	10YR 5/3	/	SiCL	1MPL → FGR	SO	FR	SS/PO	/	GR [illegible] CB [illegible] ST [illegible]	3VF 1F [illegible]	3VF IN	[illegible]		[illegible]
Bw C1	8-20	2.5Y 4/3	2.5Y 6/3	/	SiCL	2C-M ABK	HA	VFI	VS/VP	[illegible]	GR [illegible] CB [illegible] ST [illegible]	[illegible]	1VF-F TU	[illegible]		[illegible]
Bwk C2	20-50	2.5Y 4/3	2.5Y 6/2	[illegible] 7.5YR [illegible]	SiC	[illegible]	EH	VFI	VS/VP	[illegible]	GR [illegible] CB [illegible] ST [illegible]	1VF 1F	1VF-F TU	[illegible]		[illegible]
Bwk C3	50-80	2.5Y 5/2 10YR 6/6	2.5Y 6/3 (80) 10YR 7/6 (20)	[illegible]	SiC	[illegible]	[illegible]	VFI	VS/VP	[illegible]	GR [illegible] CB [illegible] ST [illegible]	/	1VF TU	[illegible]		[illegible]
Bk1 2C4	80-105	2.5Y 5/2	2.5Y 6/2	[illegible] 7.5YR [illegible]	CL	[illegible]	[illegible]	EFI	VS/VP	[illegible]	GR [illegible] CB [illegible] ST [illegible]	/	2VF TU			[illegible]
Bk2 2C5	105-125	10YR 5/3 10YR 5/6	10YR 6/3 10YR 6/6	[illegible] 7.5YR [illegible]	LOAM	[illegible]	[illegible]	FR	SS/PS		GR [illegible] CB [illegible] ST [illegible]	/	2VF IN 1F TU	[illegible]		

26. Particle Size Control Section	a. Depth: 10-40"	b. Average Clay %: >35	c. Average Rock Fragment Content: 3	27. Depth to Lithic or Paralithic Contact: >125"

28. Diagnostic Horizons	a. Surface: MOLLIC	b. Subsurface: CALCIC	29. Moist Control Section Depth: 10-30"

Previous edition [illegible]

FS 2500-1 (2/86)

USDA - Forest Service Aridic ~~TYPIC~~ (~~...~~) USTORTHENT (Reference FSH 2509.18) 037 387 4140122

1. Map Unit	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location
[redacted]	mixed, super, mesic ~~Fine~~ ~~SMECTITIC~~	[redacted]	GG		27		Sec. ___ T. [redacted] R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow Soil Survey			Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Backhoe Pit		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock
Eroded - Fan/Terrace...	3	Convex	250'	270°	WD	a. GR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Sagebrush - Rabbitbrush - Grasses			None

HORIZON DESIGNATION (a)	Inches DEPTH (b)	COLOR Moist (1)	COLOR Dry (2)	Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	SPECIAL FEATURES Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	[illegible]	10YR 4/2	10YR 5/2	/	[illegible]	2m-f SBK	[illegible]	FI	SS/PS	/	GR CB ST	[illegible]	2VF IN 2F TU	[illegible]		[illegible]
Bw	[illegible]	2.5Y 5/3	2.5Y 6/2	/	[illegible]	[illegible]	[illegible]	VFI	S/VP	/	GR CB ST	1VF IM 2F	1VF-F TU	[illegible]		[illegible]
Bw	[illegible]	2.5Y 4/3	2.5Y 6/3	/	[illegible]	[illegible]	[illegible]	EFI	VS/VP	/	GR CB ST	1F IM 1VF	1VF TU	[illegible]		[illegible]
Bw	[illegible]-65	2.5Y 5/3	2.5Y 6/2	/	[illegible]	[illegible]	[illegible]	EFI	VS/VP	/	GR CB ST	[illegible]	1VF TU	[illegible]		C S
2Bk	65	10YR 5/3 10YR 5/6	10YR 6/2 10YR 6/4	(70) (30)	[illegible]	[illegible]	[illegible]	VFI	SS/P	/	GR CB ST	[illegible]	2VF-1F TU	[illegible]		A [illegible]
2Bk2	[illegible]	10YR 5/4	10YR 7/3	Few Faint	LS	[illegible]	[illegible]	FR	SO/PO	/	GR CB ST	/	3VF IN	E		[illegible]
3Bk	[illegible]	7.5YR 5/4	7.5YR 6/4	3S Distinct	LS	[illegible]	[illegible]	FR	SO/PO		GR CB ST	/	3VF IN	E		[illegible]
	[illegible]			[illegible]							GR CB ST			VE		
											GR CB ST					

26. Partical Size Control Section	a. Depth	b. Average Clay %	c. Average Rock Fragment Content	27. Depth to Lithic or Paralithic Contact
	10-40"	>35	0	>140"

28. Diagnostic Horizons	a. Surface	b. Subsurface	29. Moist Control Section Depth
	Ochric	Calcic	10-30"

FS 2500-1 (2/86)

Previous edition ... Note.

SOIL DESCRIPTION

USDA - Forest S[illegible] Aridic Calcixerept (Reference [illegible] 2509.18) UTM #(1586) 0371447 4140522

1. Map Unit Symbol	2. Family or Series	3. Date	[illegible]ay	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
11	Fale mixed, super, mesic Typic Ustorthent	11/15/04	BC		28		Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
[illegible]	Backhoe		UT	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion:
[illegible]	Tropic Shale		a. Kind [illegible] b. Class

18. Landform	19. Slope:	20. Drainage Class	21. Surface Stone and Rock
[illegible]slope	a. % 5 b. Shape concave c. Length 200 d. Aspect 200	SPO	a. GR 0 b. CB 2 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Grass? Rabbitbrush (Seeded)	15"?		None

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 4/2	2.5Y 5/3	/	SiC	2 m-f GR	HA	FI	S/P	/	GR 0 CB 0 ST 0	2 vf 1 F	2 vf IN 1 F TU	ST		CS
Bw C1	8-24	2.5Y 5/2	2.5Y 6/1	/	CLAY	2 m-c SBK	VH	VFI	VS/VP	/	GR 0 CB 0 ST 0	1 vF 1 F	1 vF-F TU	ST		GW
Bwk C2	24-48	2.5Y 5/3	2.5Y 6/1	/	CLAY	3 c pl [illegible]	VH	VFI	VS/VP	/	GR 2 CB 0 ST 0	/	1 vF-F TU	2 f CAM ST		GW
Bk1 C3	48-72	2.5Y 5/3	2.5Y 6/2		SiC	MASSIVE	VH	VFI	VS/VP	/	GR 2 CB 0 ST 0	/	1 vF TU	2 m CAY ST		
C4	72-100	2.5Y 5/2	2.5Y 6/2		SiC	MASSIVE	EH	EFI	VS/VP	/	GR CB ST		1 vF TU	1 m CAM ST		
											GR CB ST					
											GR CB ST					
											GR CB ST					
											GR CB ST					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	>35"	2	>100"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	CALCIC	10-30"

USDA - Fore[redacted]ice

SOIL [redacted]SCRIPTION

(Refe[redacted] H 2509.18) Aridic

0371280 4140210 [redacted]

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
9	mixed, super FINE SMECTITIC TYPIC HAPLUSTOLL	11/15/[redacted]	DC	2FIS3	29		Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
COALHOLLOW HIDDEN ROAD	BACKHOE PIT		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	TROPIC SHALE		SHEET	SHEET

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
FOOTSLOPE	3	CONCAVE	70	280°	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
PJ W/ SAGEBRUSH			

HORIZON DESIGNATION (a)	Inches DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 3/4	10YR 5/3	/	LOAM 27	2MF SBK		FR	SS/PO	/	GR - 0 CB - 0 ST - 0	2VF IN 2F TU	2F IN 1VF	SE		
B2	6-12	10YR 4/3	10YR 6/3	/	LOAM 29			FI	SS/PS	/	GR - 0 CB - 0 ST - 0	2VF IN 1F TU	2F 2M 2VF	SE		CS
C1	12-36	2.5Y 5/3	2.5Y 6/2	/	SIC 39	3MPR		VFI	VS/VP	/	GR - CB - ST -	1VF-F TU	1VF 1F	ST		CW
C2	36-60	2.5Y 5/2	2.5Y 7/2	/	SIC 42			VFI	VS/VP	/	GR - 2 CB - 2 ST -	1F TU	VVF			
C3	60-115	2.5Y 5/2 10YR 5/3	2.5Y 6/3 (60) 10YR 6/4 (40)		CLAY 44	MASSIVE		VFI	VS/VP	/	GR - 4 CB - 2 ST - 0	1VF TU	/			
C4	115-138	2.5Y 5/1 2.5Y 5/3	2.5Y 6/2 2.5Y 6/1		CLAY 45	MASSIVE		EFI	VS/VP	/	GR - 2 CB - 2 ST - 0	1VF-F TU	/	ST		
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	>35"	3%	>138"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	CALCIC	10-30"

Previous edition ... lete.

USDA - Forest Service Aridic

SOIL DESCRIPTION
(Reference FSH 2509.18) 03715

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
1	mixed Typic Haplargids, mesic	11-15	PBC		20		

9. Area	10. Forest	11. Ranger District	12. State	13. County

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind, b. Class
	SHALE		

18. Landform	19. Slope: a. % / b. Shape / c. Length / d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR, b. CB, c. ST, d. BY
	a. % 4, b. Shape PLANAR, c. Length 150, d. Aspect 280	SPD	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASSES	16-17"		

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	2.5Y 4/3	2.5Y 5/2	/	SiC 32		SO	FR	SS/PS	/	GR: CB: ST:		3VF IN 1F TU			
		2.5Y 4/2	2.5Y 6/2	/	CLAY 42		HA	FI	VS/VP		GR: CB: ST:		1VF-F TU			
		10YR 4/3	10YR 6/3	/	CLAY 43		VH	VFI	VS/VP	/	GR: CB: ST:	VF	1VF-F TU			
Ck1		10YR 5/3	2.5Y 6/1	/	CLAY 43		VH	EFI	VS/VP	/	GR: CB: ST:	/	1VF TU			
Ck2		10YR 5/3	10YR 6/2	CARBONATE NODULES	SiC 40		EH	EFI	VS/VP	/	GR: CB: ST:		1VF TU			
	105-120	AUGERED,		NOT IN	BOX						GR: CB: ST:					
											GR: CB: ST:					
											GR: CB: ST:					
											GR: CB: ST:					

26. Partical Size Control Section	a. Depth: 10-40"	b. Average Clay %: >40"	c. Average Rock Fragment Content: 2	27. Depth to Lithic or Paralithic Contact: >120"
28. Diagnostic Horizons	a. Surface: OCHRIC		b. Subsurface: CALCIC	29. Moist Control Section Depth: 10-30"

USDA - Forest Service (Reference FSH 2509.18)

FLUVENTIC HAPLUSTOLL

1. Map Unit S[redacted]	2. Family or Series	3. Date [redacted] By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec ___ T[redacted] R ___
3	~~CALCIC~~ ARGIUSTOLL	BC		31		

9. Area	10. Forest	11. Range District	12. State	13. County
	mix, super, mesic			

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___
	MIXED ALLUVIUM		

18. Landform	19. Slope: a. % 1 b. Shape ___ c. Length ___ d. Aspect 270°	20. Drainage Class	21. Surface Stone and Rock a. GR ___ b. CB ___ c. ST ___ d. BY ___
		WD	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d) %	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-7	10YR 3/3	10YR 4/2		23			FR	SS/PS		GR - 0 CB - 0 ST - 0		3VF 1N			
		10YR 4/4	10YR 6/4		27			FI	SS/P		GR - 0 CB - 0 ST - 0		2VF-F TU			
	17-38	7.5YR 4/3	7.5YR 5/3		29			FI	SS/P		GR CB ST		1VF-F TU	ST		
2	38-52	2.5Y 5/3	2.5Y 6/2		40			EFI	VS/VP		GR - 0 CB - 0 ST - 0	1F	1VF-F TU			A S
		10YR 5/3	10YR 7/3		15			VFI	SS/PO		GR CB ST		2VF, 1F TU	VE		A S
2		7.5YR 5/4	7.5YR 7/4		8		LO	LO	SO/PO		GR CB ST	1F	3VF 1N			
		NOT SAMPLED			5	SG	LO	LO	SO/PO		GR CB ST					
											GR CB ST					
											GR CB ST					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	17-37"	18-35	0	> 7

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC (w/ MIXING)	CALCIC	10-30

USDA - Forest [illegible]

SOIL [illegible]RIPTION

(Refer[illegible] .l 2509.18)

Typic Calciustoll

037.05A 4140104

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
31	Fine-loamy mix super mesic ~~[illegible]~~	11/14/06	BL		32		

9. Area	10. Forest	11. Ranger District	12. State	13. County
[illegible] Survey			UT	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___
Alluvium	Alluvium - Mixed		

18. Landform	19. Slope: a. % 2 b. Shape concave c. Length 150' d. Aspect 280	20. Drainage Class	21. Surface Stone and Rock a. GR 0 b. CB 0 c. ST 0 d. BY 0
Alluvial Fan		WD	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Fallow Field Midway Acres			None Moist sand @ 10 ft

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d) % C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 3/2	10YR 5/3	/	Loam 24	2M-F GR	SO	FR	SS/PS	/	GR 0 CB 0 ST 0	2VF 1VF 1M	3VF IN 1F TU	NE		C,S
Bt	8-17	10YR 4/3	10YR 6/3	/	Clay Loam 31	2F M SBK	SH	FI	S/PS	2MK PF	GR 0 CB 0 ST 0	1F 1VF	1VF-F TU	[illegible]		C,W
Btk1	17-31	10YR 4/4	10YR 6/4	/	Clay Loam 34	2M ABK	VH	VFI	S/PS	2MK PF	GR 0 CB 0 ST 0	1VF	1VF-F TU	[illegible]		C,W
[illegible]	[illegible]	7.5YR 4/3	7.5YR 6/4	/	SiC 39	3CM ABK	EH	EFI	VS/VP	1MPF	GR 0 CB 0 ST 0	1F	1VF-F TU	ST		C,S
Bk3	[illegible]	7.5YR 5/3 7.5YR 5/2	7.5YR 7/2 7.5YR 6/4	(70) (30)	Loam 23	3CM SBK	EH	VFI	S/P	/	GR 0 CB 0 ST 0	/	1VF-F TU	[illegible]		A,S
C1	[illegible]	7.5YR 5/3	7.5YR 7/4	/	SL 18	MASS [illegible]	HA	FR	SS/PS	/	GR 0 CB 0 ST 0	/	1VF-F TU	[illegible]		A,S
2C1	[illegible]	2.5Y 4/3	2.5Y 6/3	[illegible]	SiC 43	MASS [illegible]	LO	EF	S/P	/	GR 0 CB 0 ST 0	/	1VF TU	VE		A,S
2C2	115-143	Sampled for Box only 7.5YR 5/4	7.5YR 7/3	7.5YR 3/6	Coarse sand 6	SG	LO	LO	SO/PO		GR 0 CB 0 ST 0	/	3VF IN	NE		[illegible]
											GR · CB · ST ·					

26. Partical Size Control Section	a. Depth: 10-40"	b. Average Clay %: 33	c. Average Rock Fragment Content: 0	27. Depth to Lithic or Paralithic Contact: >140"
28. Diagnostic Horizons	**a. Surface:** Mollic		**b. Subsurface:** Calcic	**29. Moist Control Section Depth:** 10-30"

FS-2500-1 (7/06)

USDA - Fore[…]ice

SOIL DESCRIPTION

(Refe[…] 2509.18)

Aridic Calcixeroll

UTM 0371150 4190270

1. Map Unit Symbol: 1
2. Family or Series: mixed ~~…~~ super, mesic
3. Date: 11/13/…
4. By: BC
5. Photo. No.:
6. Stop No.: 33
7. USGS Quad:
8. Location: Sec. ___ T. ___ R. ___
9. Area:
10. Forest:
11. Ranger District:
12. State: Utah
13. County: Kane
14. Parent Material:
15. Bedrock Name:
16. Elevation:
17. Erosion: a. Kind ___ b. Class ___
18. Landform: Fanslope
19. Slope: a. % 2 b. Shape Planar c. Length 200 d. Aspect 230
20. Drainage Class: WD
21. Surface Stone and Rock: a. GR 0 b. CB 0 c. ST 0 d. BY 0
22. Potential Natural Vegetation:
23. Annual Precipitation: 15-16
24. Measured Soil Temperature:
25. Water Table (Depth): None

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	COLOR Dry (2)	Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-10	7.5YR 3/3	7.5YR 5/3	/			SH	FR	SS/PS	/	GR 0 CB 0 ST 0	3VF 1F 1M	3VF 1M 1F TU			G, W
Bw	10-24	10YR 4/2	10YR 6/3	/				FI	VS/VP	/	GR 0 CB 0 ST 0	2VF 1F 1M	2VF 2F TU			G, W
	24-	2.5Y 4/3	2.5Y 6/3				VH	EFI	VS/VP	/	GR 0 CB 0 ST 0	1VF 1F	1VF-F TU	ST		G, W
	-70	2.5Y 5/4 / 7.5Y 5/4	2.5Y 6/2 (80) / 7.5YR 6/3 (20)					VFI	VS/VP		GR 0 CB 0 ST 0	/	1VF TU			G, W
Bk2	70-100	2.5Y 5/3	2.5Y 6/3	CARBONATE CONCENTRATIONS				EFI	VS/VP		GR 0 CB 0 ST 0	/	1VF TU			
											GR CB ST					
											GR CB ST					
											GR CB ST					
											GR CB ST					

26. Partical Size Control Section: a. Depth: 10-40" b. Average Clay %: 39 c. Average Rock Fragment Content: 0

27. Depth to Lithic or Paralithic Contact: 70 inches

28. Diagnostic Horizons: a. Surface: Mollic b. Subsurface: Calcic

29. Moist Control Section Depth: 10-30"

USDA - Forest [illegible]

fine-loamy mx super mesic Aridic Calciustoll

SOIL D[illegible]RIPTION

(Referen[illegible] 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___

18. Landform	19. Slope: a. % ___ b. Shape ___ c. Length ___ d. Aspect ___	20. Drainage Class	21. Surface Stone and Rock a. GR ___ b. CB ___ c. ST ___ d. BY ___

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table *(Depth)*

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (k) Cutans (1)	SPECIAL FEATURES (k) % of Rock Fragments (2)	SPECIAL FEATURES (k) Roots (3)	SPECIAL FEATURES (k) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A			10YR 5/3		SiL	24						GR - CB - ST -				7.6	
		10YR 4/3	10YR 6/3		SiL	27						GR - CB - ST -				7.4	
K		10YR 5/4	10YR 7/3		SiL	26						GR - CB - ST -			ST 5 f CAM	8.2	
K2		10YR 5/3	10YR 6/3			14						GR - CB - ST -			10 fm CAM	8.5	
2BK		10YR 5/3	10YR 7/3			3						GR - CB - ST -			15 fm CAM	8.6	
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:

28. Diagnostic Horizons	a. Surface:	b. Subsurface: ARGIC	29. Moist Control Section Depth:

EXISTING ATION

30. (Species)	.S (% Crown Cover)	31. (Species)	SHRUBS (% Crown Cover)	pecies)	FORBS (% Crown Cover)	33. (Species)	GRASSES own Cover)

34. Additional Notes (*Use and Management*):

[illegible] TOP 5 SAMPLES

SOIL [illegible] BOX TAKEN

USDA - Forest Service

SOIL DESCRIPTION

(Reference FSH 2509.18)

Aridic Calciustoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
[illegible]	fine-loamy, mix, super, mesic	[illegible]	[illegible]		[illegible]	[illegible]	

9. Area	10. Forest	11. Ranger District	12. State	13. County
[illegible]	[illegible]		Utah	[illegible]

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___
[illegible]			

18. Landform	19. Slope: a. % ___ b. Shape ___ c. Length ___ d. Aspect ___	20. Drainage Class	21. Surface Stone and Rock a. GR ___ b. CB ___ c. ST ___ d. BY ___
[illegible]		WD	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
[illegible]			

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE Moist (2)	CONSISTENCE Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A1	[illegible]	10YR 3/3	10YR 5/2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		GR - CB - ST -	[illegible]		[illegible]	7.4	[illegible]
A2 ~~[illegible]~~	[illegible]	10YR 5/4	10YR 6/3			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GR - CB - ST -	[illegible]		[illegible]	7.6	[illegible]
BK	14-30	10YR 5/3	10YR 7/3		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GR - CB - ST -	[illegible]		ST 5f CAM	8.4	[illegible]
BK1 ~~[illegible]~~	30-45	10YR 5/3	10YR 7/3		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		GR - 2 CB - ST -			[illegible] 15 m CAM	8.6	[illegible]
BK2 ~~[illegible]~~	45-70	10YR 6/3	10YR 7/2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		GR - CB - ST -			[illegible] 20 m CAM	8.6	[illegible]
2C	70-98	10YR 6/3	10YR 8/3		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		GR - CB - ST -			15 fm CAM [illegible]	8.7	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	[illegible]	[illegible]	[illegible]	[illegible]

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	[illegible]	[illegible]	[illegible]

EXISTING V ATION

30. (Species) .S (% Crown Cover)	31. (Species) SHRUBS (% Crown Cover)	pecies) FORBS (% Crown Cover)	33. (Species) GRASSES n Cover)

34. Additional Notes *(Use and Management)*:

AUGERED [illegible] 20 THEN [illegible]

LAB CHARACTERIZED TOP 5 SAMPLES 0-9"

9-19"

19-30

SOIL MICRO-BOX TAKEN

30-45

45-65

USDA - Fore[redacted]ce

SOIL[redacted]CRIPTION
(Refere[redacted]SH 2509.18)

[redacted]

Aridic

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
[illegible]	super fi [illegible]	3/7/[illegible]	[illegible]		36	[illegible]	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
[illegible]	mesic		[illegible]	[illegible]

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___
[illegible]	[illegible]		[illegible]

18. Landform	19. Slope: a. % ___ b. Shape ___ c. Length 75 d. Aspect ___	20. Drainage Class	21. Surface Stone and Rock a. GR ___ b. CB ___ c. ST 3 d. BY ___
[illegible]			

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
[illegible]	[illegible]		[illegible]

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
[illegible]	[illegible]	[illegible]	10YR 5/3		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		GR - CB - ST -	[illegible]		[illegible]	7.9	[illegible]
[illegible]	[illegible]	[illegible]	10YR 6/3		SL 12	[illegible]	HA	[illegible]	[illegible]		GR - CB - ST -	[illegible]		SE 2vfCAM	8.2	[illegible]
K [illegible]	[illegible]	10YR 5/4	10YR 7/3		SL 10	[illegible]	[illegible]	[illegible]	[illegible]		GR - CB - ST -	[illegible]		ST 8fCAM	8.4	[illegible]
BK	[illegible]	10YR 5/4	10YR 7/3		LS	[illegible]	[illegible]	[illegible]	[illegible]		GR - CB - ST -			ST 12fCAM	8.4	[illegible]
[illegible]	[illegible]	10YR 5/3	10YR 6/3			[illegible]	[illegible]	[illegible]	[illegible]		GR - CB - ST -			ST CAC BRF	8.4	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
		[illegible]	[illegible]	

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
		cambic / calcic	

Previous edition [illegible]lete.

FS 2500-[illegible] (2/86)

EXISTING V[illegible]ATION

30. *(Species)* [illegible]S	*(% Crown Cover)*	31. *(Species)* SHRUBS	*(% Crown Cover)*	[illegible]ecies) FORBS	*(% Crown Cover)*	33. *(Species)* GRASSES	*([illegible]n Cover)*

34. Additional Notes *(Use and Management)*:

SAMPLED BY AUGER [illegible] 35" FROM TRENCH BOTTOM

[illegible] 4 [illegible] TO 68'

[illegible] A CAVED OUT

MICRO-SOIL BOX MADE

SOIL DESCRIPTION

Soil Type

File No.

Area | Date | Stop No.

Classification Aridic

Location: Section T R

Veg.

Parent Material | Climate (Precip.)

Physiography | Surface Rock Fragments Gravel

Relief | Drainage | Surface Rock Fragments Cobble

Elevation | Gr.water | Surface Rock Fragments Stones

Slope | Range | Moisture | Surface Rock Fragments Other

Aspect/Degrees | Root Distr. | % Clay *PSCS

Erosion | % Coarse fragments *PSCS | % Coarser than V.F.S. *PSCS

Permeability | Range Site

GPS Latitude N | Microbiotic Crust Class

GPS Longitude W | Rock Formation/Type

GPS Elevation | Topo Quad Name

Soil Temp at 20" F | Photo Number

Additional Notes

*Control Section Average

Horizon	Depth	Color Dry	Color Moist	Texture Clay	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction Effer.	Boundary	Rock Frags	Root	Pore	Ped Surface Features
		10YR 5/3							ME					pH 7, 2
		10YR 5/3							ME					7.2
wk1		10YR 6/3							5fCAM ST					7.8
Bwk2		10YR 7/4	10YR 5/4						15fmCAM ST					8.4
Bk1		10YR 7/4	10YR 5/4						15fcam					8.4
2Bk1		10YR 7/4	10YR 5/4						10fvfCAM ST					8.4
2Bk2		10YR 7/3	10YR 5/3						VE 15fvfCAM					8.4

Microbiotic Crust

Two classes are suggested:

Immature - gray crust of cyanobacteria the sheaths and filaments of which connect soil particles; takes about 5 years to develop

Mature - dark black crust with pedestals; in addition to the bacteria it includes mosses, fungi, and lichens; takes 50 or more years to develop

Quantity definitions for percentage surface cover of microbiotic crusts

- Very few - less than 5% per 10 square feet
- Few - 5 to 15% per 10 square feet
- Common - 15 to 50% per 10 square feet
- Many - more than 50% per 10 square feet

Plasticity

Fld. Code	Class	Description	Fld. Code	Class	Description
PO	Non-plastic	4cm long /6mm thick roll cannot be formed	P	Moderately	4cm long/4mm thick roll will support weitht
PS	Slightly plastic	4cm long/ 6mm thick roll will support weight	VP	Very plastic	4cm long/2mm thick roll will support weight

Stickiness

Fld. Code	Class	Description	Fld. Code	Class	Description
SO	Non-sticky	No material adheres to thumb or forefinger	S	Moderately	Adheres to both digits;stretches slightly
SS	Slightly sticky	Adheres to both digits; does not stretch appreciably	VS	Very sticky	Adheres to both digits;stretches appreciably

Effervescence

Fld. Code	Class	Description	Est. CCE	Fld. Code	Class	Description	Est. CCE
eo	Non-effervescent	No bubbles seen	0	es	Strongly effervescent	Bubbles form low foam	15-40
e	Very slightly efferv.	Few bubbles seen	1-3	ev	Violently effervescent	Forms thick foam quickly	40+
em	Slightly effervescent	Bubbles readily seen	3-15				

Pores

Pores are described as a *quantity class*, *diameter size*, and *shape*

Quantity Class Definitions

Per Unit Area Definitions

- 1 centimeter squared for very fine and fine pores (.40 in^2)
- 1 decimeter squared for medium and coarse pores (4 in^2)
- 1 meter squared for very coarse pores (40 in^2)

Quantity Definitions

- Few - less than 1 per unit area
- Common - 1 to 5 per unit area
- Many - more than 5 per unit area

Diameter Definitions

- Very fine - less than 0.5 mm
- Fine - 1 to 2 mm
- Medium - 2 to 5 mm
- Coarse - 5 to 10 mm
- Very coarse - more than 10 mm

2 common pore shapes are present:

- Tubular - cylindrical or elongated
- Vesicular - spherical or elliptical

Roots

Roots are described as a *quantity class and diameter*

Quantity Class Definitions

Per Unit Area Definition s

- 1 centimeter squared for very fine and fine pores (.40 in^2)
- 1 decimeter squared for medium and coarse pores (4 in^2)
- 1 meter squared for very coarse pores (40 in^2)

Quantity Definitions

- Very few - less than .2 per unit area
- Moderately few - .2 to 1 per unit area
- Few - less than 1 per unit area
- Common - 1 to 5 per unit area
- Many - more than 5 per unit area

Diameter Definitions

- Very fine - less than 1 mm
- Fine - 1 to 2 mm
- Medium - 2 to 5 mm
- Coarse - 5 to 10 mm
- Very coarse - more than 10 mm

Terms for Rock Fragments

Shape and Size	Noun	Shape and Size	Noun
Seherical, cubelike, or equiaxial:		Flat:	
2-75 mm diameter	Gravel	2-150 mm long	Channers
75-250 mm diameter	Cobbles	150-380 mm long	Flagstone
250-600 mm diameter	Stones	380-600 mm long	Stones
≥600 mm diameter	Boulders	≥600 mm long	Boulders

Rupture Resistance Classes for Blocklike Specimens

Classes Dry	Moist	Test Description
Loose	Loose	Specimen not obtainable
Soft	Very friable	Fails under very slight force applied slowly between thumb and forefinger
Slightly hard	Friable	Fails under slight force applied slowly between thumb and forefinger
Moderately hard	Firm	Fails under moderate force applied slowly between thumb and forefinger
Hard	Very firm	Fails under strong force applied slowly between thumb and forefinger
Very hard	Extremely firm	Cannot be failed between thumb and forefinger but can be between both hands or by placing on a nonresilent surface and applying gentle force underfoot

USDA - Forest Service

SOIL DESCRIPTION
(Reference FSH 2509.18)

fine, mx, super frigid Aeric Epiaquept

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
7					33		

9. Area	10. Forest	11. Ranger District	12. State	13. County

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___

18. Landform	19. Slope: a. % ___ b. Shape ___ c. Length ___ d. Aspect ___	20. Drainage Class	21. Surface Stone and Rock a. GR ___ b. CB ___ c. ST ___ d. BY ___
		PP	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A		4/2	10YR 6/2			sbk	sh		SP		GR - CB - ST -				7.5	
B	6-12	5/4	10YR 7/3			pr	h	fi	SP		GR - CB - ST -			ST 3fc AM	8.0	
		10YR 6/4	7/2				h	fi	SP		GR - CB - ST -			25fm CAM VE	8.6	
	40	10YR 7/2	10YR 8/1		silt	m	h	f	SP		GR - CB - ST -			40m CAM VE	8.7	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
28. Diagnostic Horizons	a. Surface:	b. Subsurface:		29. Moist Control Section Depth:

Previous edition ...lete.

FS 2500-1 (2/86)

EXISTING V ATION

30. *(Species)*	S *(% Crown Cover)*	31. *(Species)* SHRUBS	*(% Crown Cover)*	*ecies)* FORBS	*(% Crown Cover)*	33. *(Species)* GRASSES	*(n Cover)*

34. Additional Notes *(Use and Management)*:

All 4

USDA - Fores[redacted]e Aridic

SOIL [redacted]RIPTION

(Referen[redacted]H 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ____ T. ____ R. ____
4							

9. Area	10. Forest	11. Ranger District	12. State	13. County
	super, mesic			

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ____ b. Class ____

18. Landform	19. Slope: a. % ____ b. Shape ____ c. Length ____ d. Aspect ____	20. Drainage Class	21. Surface Stone and Rock a. GR ____ b. CB ____ c. ST ____ d. BY ____

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table *(Depth)*

HORIZON DESIGNATION *(a)*	DEPTH *(b)*	COLOR *(c)* Moist *(1)*	COLOR Dry *(2)*	COLOR Mottling *(3)*	TEXTURE *(d)*	%C	STRUCTURE *(e)*	CONSISTENCE *(f)* Dry *(1)*	CONSISTENCE Moist *(2)*	CONSISTENCE Wet *(3)*	SPECIAL FEATURES *(g)* Cutans *(1)*	% of Rock Fragments *(2)*	Roots *(3)*	Pores *(4)*	EFFER. CLASS *(h)*	FIELD pH *(i)*	BOUNDARY *(j)*
			10YR 5/3									GR - CB - ST -				7.6	
			10YR 5/4			24						GR - CB - ST -			VS	7.8	
		5/	10YR 6/4			15						GR - CB - ST -			ST 3% CAM	8.[illegible]	
		10YR 5/4	10YR 7/3			7						GR - CB - ST -			ST 10% CAM	8.[illegible]	
		10YR 5/[illegible]	10YR 7/3									GR - 15 CB - ST -			15% CAM	8.2	
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %: 11	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:

EXISTING [illegible] ATION

30. (Species)	[illegible]S (% Crown Cover)	31. (Species)	SHRUBS (% Crown Cover)	[illegible] ecies)	FORBS (% Crown Cover)	33. (Species)	GRASSES [illegible] wn Cover)

34. Additional Notes (*Use and Management*):

Fair
4 [illegible] TO 36"

LAB [illegible] ONLY [illegible]

[illegible] MADE

USDA - Fore… ice

SOIL …CRIPTION

(Refer… FSH 2509.18)

Aeric Calciaquoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
7	, mixed, super frigid						

9. Area	10. Forest	11. Ranger District	12. State	13. County

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___

18. Landform	19. Slope: a. % ___ b. Shape ___ c. Length ___ d. Aspect ___	20. Drainage Class	21. Surface Stone and Rock a. GR ___ b. CB ___ c. ST ___ d. BY ___

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d) %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
		3/2	10YR 5/2								GR - CB - ST -			SE	7.8	
		4/3	10YR 6/3								GR - CB - ST -			ME	8.2	
BK		10YR 5/4	10YR 7/3								GR - CB - ST -			ST 12-15 fCAM	8.4	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
28. Diagnostic Horizons	a. Surface:	b. Subsurface:		29. Moist Control Section Depth:

EXISTING V[illegible]ATION

30. (Species) [illegible]S	(% Crown Cover)	31. (Species) SHRUBS	(% Crown Cover)	[illegible]pecies) FORBS	(% Crown Cover)	33. (Species) GRASSES	([illegible]n Cover)

34. Additional Notes ***(Use and Management):***

O – 3" Root Mat, Decomposed Plant Roots [illegible]

[illegible]

Soil [illegible] Box (Combined w/ #38)

USDA - Fores[illegible]e

SOIL [illegible]CRIPTION

(Referen[illegible] FSH 2509.18)

mesic
fine mixed, super Aridic Calciustoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
-9					41		

9. Area	10. Forest	11. Ranger District	12. State	13. County

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___

18. Landform	19. Slope: a. % ___ b. Shape ___ c. Length ___ d. Aspect ___	20. Drainage Class	21. Surface Stone and Rock a. CR ___ b. CB ___ c. ST ___ d. BY ___

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A1	0-6	10YR 3/3	10YR 5/3	/								CR - CB - ST -			NE	7.9	
A2	6-12	10YR 3/3	10YR 5/3	/	CL	38						CR - CB - ST -			NE	8.0	
Bwk	12-36	10YR 4/3	10YR 6/3	/	C	42						CR - CB - ST -			ST 3-5 f CAM	8.2	
Bk1	36-64	10YR 5/4	10YR 7/3	/	CL	32						CR - CB - ST -			VE 12 fm CAM	8.2	
Bk2	64-80	10YR 5/4	10YR 7/4	/	SCL	22						CR - CB - ST -			VE 10 f CAM	8.6	
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	40	0	760"

28 Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	cambic / Calcic	

FS-2500-1 (2/9[illegible])

30. (Species) TREES (% Crown Cover)	31. (Species) SHRUBS (% Crown Cover)	32. (Species) FORBS (% Crown Cover)	33. (Species) GRASSES (% Crown Cover)

34. Additional Notes (*Use and Management*):

[illegible]

2 Fish Ponds, 1 [illegible]

[illegible]

[illegible]

USDA - Forest Service

SOIL DESCRIPTION

(Reference FSH 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
#9					42		

9. Area	10. Forest	11. Ranger District	12. State	13. County

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ___ b. Class ___

18. Landform	19. Slope: a. % ___ b. Shape ___ c. Length ___ d. Aspect ___	20. Drainage Class	21. Surface Stone and Rock: a. CR ___ b. CB ___ c. ST ___ d. BY ___
	a. % 7		

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A			10YR 5/3		CB L	20						CR - CB - ST -			ME	7.8	
2Bw		10YR 4/3	10YR 6/3		CB C	43						CR - CB - ST -			ST	8.2	
2Bck	36	10YR 5/3	10YR 6/3		SCL	21						CR - CB - ST -			ST	8.4	
2BK	36-45	10YR 5/4	10YR 6/4		L	22						CR - CB - ST -				8.6	
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					
												CR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	31%		

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth.

30. (Species) TREES	(% Crown Cover)	31. (Species) SHRUBS	(% Crown Cover)	32. (Species) FORBS	(% Crown Cover)	33. (Species) GRASSES	(% Crown Cover)

34. Additional Notes (*Use and Management*):

SAMPLED

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 43 — DRAFT 3/2002

Series or Component Name:

Map Unit Symbol: 7

Photo #:

Classification: Typic Argiaquoll fine, mixed, superactive, frigid

Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long

Date: Apr 5, 2007

Weather: High clouds

Temp.: Air: Soil: Depth:

Latitude: ° ' " N

Longitude: ° ' " W

Datum: 1983

Location: Sec. T. R.

UTM: Zone : mE: mN:

Topo Quad:

Site ID: Yr: State: County: Pedon #:

Soil Survey Area:

MLRA / LRU:

Transect: ID: Stop #: Interval:

Landscape: Bench

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: 55W 210°

Slope (%): 4

Slope Complexity: Simple

Slope Shape: (Up & Dn / Across) Linear / Linear

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physic. Area:

Local Physio. Area:

Drainage: Very Poorly

Flooding: —

Ponding: Oc

Soil Moisture Status: Saturated

Permeability: K_{sat}: Very slow

Land Cover / Use: Pasture

Parent Material: Alluvium

Bedrock: Kind: Fract.: Hard.: Depth:

Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree: None

Runoff: mod slow

Surface Frag %: GR: — CB: — ST: — BD: — CN: — FL: —
Kind:

Diagnostic Horz. / Prop.: Kind: Depth:
Mollic 0-7"
Argillic 7-30"
Calcic 17-96"

P. S. Control Section : Depth Range: 7-27"

Ave. Clay %: 40

Ave. Rock Frag %: 0

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	Wildrose	
	Bluegrass	
	Sedges	

MISCELLANEOUS FIELD NOTES / SKETCH :

water flowing in 30-54" layer
& perching on 54-72"

4/3

	Component Name:						Map Unit Symbol:						Date: Apr 5, 2007
	Obser. Method	Depth (in) ~~(cm)~~	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture mo	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-7"	A	cs	10YR 5/3	10YR 3/3	L	—	2m sbk	VH	fr	ss	mP	—
2		7-17	Bt	cs	10YR 6/2	10YR 3/3	C	—	3 mc pr 2f sbk	XH	fi	s	P	20 fm 7.5YR 6/6
3		17-30	Btk	cs	10YR 7/2	10YR 4/3	CL	—	3 m pr 2f sbk	VH	fi	s	P	35 fm 7.5YR 6/4
4		30-54	Bk	as	10YR 7/2 7/4	10YR 4/2	SiL	—	2 m pr 1 f sbk	VH	fr	ss	mP	45 fm 10YR 5/4
5		54-72	2Btk1	gs	10YR 7/1	10YR 4/1	C	—	3 m pr	XH	vfi	vs	vP	50 m 7.5YR 6/6
6		72-96"	2Btk2		10YR 8/1	10YR 6/1	SiC	—	2cm pr	XH	vfi	vs	vP	35 mc 10YR 6/8
7														
8					mollic	after	mixing	0-7"						
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	3vff 1m	2vft	8.2	SE	24		
2	—	—	85 CLF PF/PO	3vff 1m	1vft	8.4	SE	42		
3	—	15f CAM	75 CLF PF/PO	2vf 1fm	1vft	8.4	ST	38		
4	—	20 fm CAM	—	2vf 1fm	1vft	8.6	ST	26		
5	—	10f CAM	100 CFF PF/PO	1vff	1vft	8.6	VE	50		
6	—	10f CAM	90 CLF PF/PO	1vf	—	8.4	VE	46		
7										
8										
9										
10										

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: 44 — DRAFT 3/2002

Series or Component Name:

Map Unit Symbol: 7

Photo #:

Classification: Aeric Epiaquept fine, mixed, [illegible] frigid

Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long

Date: Apr 5, 2007

Weather: High Clouds

Temp.: Air: Soil: Depth:

Latitude: ° ' " N **Longitude:** ° ' " W **Datum:**

Location: Sec. T. R.

UTM: Zone : mE: mN:

Topo Quad:

Site ID: Yr: State: County: Pedon #:

Soil Survey Area:

MLRA / LRU:

Transect: ID: Stop #: Interval:

Landscape:

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: 240 228°

Slope (%): 4-5

Slope Complexity: Simple

Slope Shape: (Up & Dn / Across) Linear Linear

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physio. Area:

Local Physio. Area:

Drainage: Very Poorly

Flooding: No

Ponding: Oc

Soil Moisture Status: Wn 0-14" Ws 14-34

Permeability: K_{sat}: Very slow

Land Cover / Use:

Parent Material: Alluvium

Bedrock: Kind: Fract.: Hard.: Depth: 34+ moist

Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:

Runoff:

Surface Frag %: GR: — CB: — ST: — BD: — CN: — FL: —

Kind:

Diagnostic Horz. / Prop.: Kind: Depth:

Calcic 14-96"

aquic 7"+

P. S. Control Section : Ave. Clay %: Ave. Rock Frag %:

Depth Range: 10-40"

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	Sedges	
	Bluegrass	

MISCELLANEOUS FIELD NOTES / SKETCH :

water filling pit at 14"

54-96" old decaying roots

44

Component Name: | Map Unit Symbol: | Date: Apr 5, 2007

	Obser. Method	Depth (in) ~~(cm)~~	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc (Moist color)
1	BP	0-7"	A1	cs	10YR 6/2	10YR 4/2	SiL	—	3msbk 2fsbk	H	Fr	ms	mp	—
2	↓	7-14"	A2	cs	10YR 6/2	10YR 4/2	SiCL	—	2mcpr 3fmsbk	VH	fi	ms	mp	10f 7.5YR 6/4
		14-34"	Bwk1	as	10YR 8/1	10YR 6/2	SiCL	—	1mpr 2msbk	VH	fi	ms	mp	40fm 7.5YR 6/6
4		34-54"	Bwk2	gs	10YR 8/1	10YR 6/1	C	—	3mcpr 2fsbk	XH	vfi	vs	vp	60mc 7.5YR 5/8
5		54-72"	Bwk1	gs	10YR 8/1	10YR 6/1	C	—	3mcpr	XH	vfi	vs	vp	25mc 10YR 6/6
6		72-96"	Bk2		10YR 8/1	10YR 6/1	SiL	—	m	VH	Fr	ms	mp	40fm 10YR 6/6
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	3vff 2m	2vft	8.2	SE	26		
2	—	—	—	3vff 2m	2vft	8.2	SE	28		
3	—	10 f CAM	—	2vff 1m	2vft	8.5	ST	26		
4	—	8 f CAM	—	2vf 1f	1vft	8.4	ST	48		
5	—	15 fm CAM	—	1vf	—	8.6	VE	52		
6	—	18 fm CAM	—	—	1vft	8.2	VE	26		
7										
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 45 **DRAFT 3/2002**

Series or Component Name:

Map Unit Symbol: 7

Photo #:

Classification: Aeric Endoaquept fine, mix, superactive, frigid

Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long

Date: Apr 5, 2007

Weather: **Temp.:** *Air:* *Soil:* *Depth:*

Latitude: ° ' " N **Datum:**

Longitude: ° ' " W

Location: Sec. T. R.

UTM: *Zone:* *mE:* *mN:*

Topo Quad:

Site ID: *Yr:* *State:* *County:* *Pedon #:*

Soil Survey Area: Alton

MLRA / LRU:

Transect: *ID:* *Stop #:* *Interval:*

Landscape:

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: 195° SSW

Slope (%): 3-4

Slope Complexity: Simple

Slope Shape: *(Up & Dn / Across)* Linear / Linear

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physio. Area:

Local Physio. Area:

Drainage: Poorly

Flooding: No

Ponding: Oc

Soil Moisture Status:

Permeability: K_{sat}:

Land Cover / Use: Pasture

Parent Material: Alluvium

Bedrock: *Kind:* *Fract.:* *Hard.:* *Depth:*

Lithostrat. Units: *Group:* *Formation:* *Member:*

Erosion: *Kind:* sheet *Degree:* slight

Runoff:

Surface Frag %: *GR:* — *CB:* — *ST:* — *BD:* — *CN:* — *FL:* —

Kind:

argillic too deep

P. S. Control Section: *Depth Range:* 35-48" *Ave. Clay %:* 36 *Ave. Rock Frag %:* 0

Diagnostic Horz. / Prop.:	*Kind:*	*Depth:*
Argillic		84"+
Aquic		5"+
calcic		35-48"

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER

MISCELLANEOUS FIELD NOTES / SKETCH :

Rapid in-flow of water at 66"

Fluvent

45

	Component Name:					Map Unit Symbol:						Date: Apr 05, '07
	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-5"	A1	cs	10YR 6/2	10YR 4/2	L	—	1m sbk 2f gr	sh	vfr	ss	sp	—
2		5-12"	A2	as	2.5Y 6/2	2.5Y 4/2	L	—	2 m pr 3 f sbk	sh	vfr	ss	sp	3-4% vf 10YR 6/6
3		12-35"	C	as	10YR 7/4	10YR 5/4	SCL	—	1 m sbk	sh	vfr	ss	sp	50 mc 10YR 6/6
4		35-48"	2 Bwk	cs	10YR 7/2	10YR 6/1	SiC	—	1 m pr 2 m sbk	h	fr	ms	mp	30 mc 7.5YR 5/4
5		48-66"	3C1	gs	10YR 8/2	10YR 6/4	SCL	—	m	h	vfr	ss	sp	50 mc 10YR 7/6
6		66-84"	3C2	as	10YR 8/3	10YR 6/4	SCL	—	m	vh	vfr	ss	sp	60 mc 10YR 7/6
7		84-100"	4Btk		10YR 7/1	10YR 6/1	SiC	—	3 m pr 2 m sbk	VH	fi	s	P	5f 7.5YR 7/6
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	disseminated	—	3vff 2m	2vft	8.4	ST	26		sm
2	—	disseminated	—	3vf 2f 1m	2vft	8.2	ST	26		sm
3	—	disseminated	—	2vf 1fm	2vft	8.4	ST	35		wn
4	—	12f CAM disseminated	—	1vff	1vft	8.4	VE	42		ws
5	—	8f CAM disseminated	—	1vff	1vft	8.4	ST	30		wn
6	—	4f CAM disseminated	—	1vff	1vft	8.3	ST	30		ws
7	—	8f CAM disseminated	85 CLF PF/PO	1vff	—	8.3	VE	40		moist
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 46 **DRAFT 3/2002**

Series or Component Name:

Map Unit Symbol: 7

Photo #:

Classification: fine-loamy, mixed, superactive, frigid Typic Argiaquoll

Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long

Date: Apr 5, 2007

Weather: **Temp.:** Air: Soil: Depth:

Latitude: 0 ° ' " N **Datum:**

Longitude: ° ' " W

Location: Sec. T. R.

UTM: Zone: mE: mN:

Topo Quad:

Site ID: Yr: State: County: Pedon #:

Soil Survey Area:

MLRA / LRU:

Transect: ID: Stop #: Interval:

Landscape:

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: 195° SSW

Slope (%): 3-4

Slope Complexity:

Slope Shape: (Up & Dn / Across)

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physio. Area:

Local Physio. Area:

Drainage: Somewhat Poorly

Flooding: —

Ponding: Ra

Soil Moisture Status:

Permeability: K_{sat}:

Land Cover / Use: Pasture

Parent Material: Alluvium

Bedrock: Kind: Fract.: Hard.: Depth:

Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:

Runoff:

Surface Frag %: GR: — CB: — ST: — BD: — CN: — FL: —
Kind:

Diagnostic Horz. / Prop.: Kind: Depth:
Aquic 24"+
Mollic 0-7"
Argillic 12-44"
Calcic 44-92

P. S. Control Section: Depth Range: 12-32"
Ave. Clay %: 27.2
Ave. Rock Frag %: 14%

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Grasses	

MISCELLANEOUS FIELD NOTES / SKETCH:

water flowing in at 44"

severe caving of sidewalls

Component Name: | Map Unit Symbol: | Date: Apr 5, 2007

	Obser. Method	Depth (in)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-6"	A	CS	10YR 5/3	10YR 3/3	SL	—	1 m sbk 2 f gr	sh	vfr	so	po	—
2		6-12"	A2	gs	10YR 6/3	10YR 4/4	SCL	—	1 m pr 2 f sbk	sh	vfr	ss	sp	—
3		12-17"	Bt1	CS	10YR 6/3	10YR 5/4	SCL	—	1 m pr 2 f sbk	sh	vfr	ss	sp	—
4		17-24"	Bt2	CS	10YR 6/3	10YR 4/4	GRV SCL	Gr 30 CB 10	2 m pr 3 fm sbk	sh	vfr	ss	sp	—
5		24-44"	2Bt	CS	10YR 6/4	2.5Y 4/4	CL	—	3 m pr 2 fm sbk	vh	fr	s	p	5-8 f faint 10YR 6/6
6		44-68"	2Bk1	gs	10YR 8/2	10YR 5/4	SL	—	m	vh	vfr	ss	po	25 mc strong 7.5YR 5/6
7		68-92"	2Bk2	gs	2.5Y 6/2	10YR 5/1	SL	—	m	xh	vfr	so	po	45 mc strong 10YR 6/6
8		92-120"	2C		10YR 6/2	10YR 5/1	SL	—	m	xh	vfr	so	po	65 vc strong 10YR 6/6
9														
10							mollic by mixing 0-7"							

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1		disseminated	—	2 vff 1m	2 vf ti	8.4	em	16		
2			—	2 vff 1m	2 vf t	8.5	em	18		
3			30 CLF PF/BR	2 vff 1m	2 vf t	8.4	em	22		
4			25 CLF PF/BR	2 vf 1f	2 vf ti	8.3	em	22		moist
5			65 CLF PF/BR	1 vff	1 vf t	7.8	se	35		WS
6		2 f CAM disseminated	—	1 vf	2 vf i	8.5	ST	15		WS
7		8 f CAM disseminated	—	—	2 vf i		ST	12		WS
8		4 f CAM disseminated	—	—	2 vf i		ST	12		WS
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 47

DRAFT 3/2002

Series or Component Name:

Map Unit Symbol: 8

Photo #:

Classification: Calcic Haplustalf fine-loamy, mixed, superactive, frigid

Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long

Date: Apr 5, 2007

Weather: High clouds

Temp.: Air: 55 Soil: Depth:

Latitude: ° ' " N **Longitude:** ° ' " W

Datum: 1983

Location: Sec. T. R.

UTM: Zone: mE: mN:

Topo Quad:

Site ID: Yr: State: County: Pedon #:

Soil Survey Area: Alton

MLRA / LRU:

Transect: ID: Stop #: Interval:

Landscape: Valley

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: SSW 290

Slope (%): 6

Slope Complexity: Simple

Slope Shape: (Up & Dn / Across) convex / convex

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physio. Area:

Local Physio. Area:

Drainage: Somewhat Poorly

Flooding: No

Ponding: No

Soil Moisture Status: moist

Permeability: K_{sat}: mod / slow

Land Cover / Use: Range

Parent Material: Alluvium

Bedrock: Kind: Fract.: Hard.: Depth:

Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Flow pattern Degree: slight

Runoff: mod slow

Surface Frag %:

GR:	CB:	ST:	BD:	CN:	FL:
5	–	–	–	–	–

Kind:

Diagnostic Horz. / Prop.:

Kind:	Depth:
Argillic	11-20"
Calcic	20-84"
Aquic	32"+

P. S. Control Section: Depth Range: 11-70"

Ave. Clay %: 30

Ave. Rock Frag %: 0

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Big sage	
	Rabbitbrush	
	Ut serviceberry	
	Rabbitbrush	
	Poa	

MISCELLANEOUS FIELD NOTES / SKETCH:

water running into pit at 80"

Component Name:		Map Unit Symbol:		Date: Apr 5, 2007

	Obser. Method	Depth (in) ~~(cm)~~	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-3"	A	cs	10YR 5/3	10YR 3/3	L	GR 5	2 mc sbk	sh	vfr	ss	sp	—
2		3-11"	2A	as	10YR 6/4	10YR 5/3	SL	—	1 m sbk	h	fr	so	sp	—
3		11-20"	2Bt	cw	10YR 5/3	10YR 3/3	CL	—	2 m pr 3 f vf sbk	vh	fi	ms	mp	—
4		20-32"	2Bk	cs	10YR 6/4	10YR 4/6	SCL	—	2 m pr 2 f m sbk	xh	fr	ss	sp	—
5		32-52"	3Btk	cs	10YR 6/4	10YR 3/4	Clay	—	3 c pr 2 m sbk	xh	vfi	vs	vp	10 ff 10YR 6/6
6		52-84"	3Bk		10YR 7/4	10YR 5/6	SCL	—	M	vh	vfr	ss	sp	40 mc strong 10YR 7/8
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1		disseminated	—	3 vf 2 f 1 m	2 vf i	7.6	em	24		SM
2			—	2 vf f 1 m	2 vf i	7.7	em	15		SM
3			60 CLF PF/PO	2 vf 1 f m	1 vf t	7.8	em	30		moist
4		6 vf f CAM	90 CLF PF/PO	2 vf 1 f	2 vf it	8.3	st	23		moist
5		10 f CAM	—	2 vf 1 f	—	8.3	em/st	50		moist
6		8 f CAM	—	1 vf	2 vf it	8.5	es	20		moist
7										
8										
9										
10										

USPA-NRCS

PEDON DESCRIPTION

PEDON ID #: 48

DRAFT 3/2002

Series or Component Name: 1

Map Unit Symbol: 1

Photo #:

Classification: Aridic Haplustalf fine, mixed, superactive, frigid

Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long

Date: Apr 5, 2007

Weather:

Temp.: *Air:* *Soil:* *Depth:*

Latitude: ° ' " N

Longitude: ° ' " W

Datum:

Location: Sec. T. R.

UTM: *Zone:* *mE:* *mN:*

Topo Quad:

Site ID: *Yr:* *State:* *County:* *Pedon #:*

Soil Survey Area:

MLRA / LRU:

Transect: *ID:* *Stop #:* *Interval:*

Landscape: Valley Bottom

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: ENE 80

Slope (%): 4-5

Slope Complexity: Simple

Slope Shape: *(Up & Dn / Across)* Linear / Linear

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physio. Area:

Local Physio. Area:

Drainage:

Flooding: No

Ponding: No

Soil Moisture Status:

Permeability: K_{sat}: Very slow

Land Cover / Use: Range

Parent Material: Alluvium

Bedrock: *Kind:* *Fract.:* *Hard.:* *Depth:*

Lithostrat. Units: *Group:* *Formation:* *Member:*

Erosion: *Kind:* *Degree:* None

Runoff: mod slow

Surface Frag %:

	GR:	CB:	ST:	BD:	CN:	FL:
Kind:	1-2	–	–	–	–	–

Diagnostic Horz. / Prop.:

Kind:	Depth:
Argillic	3-84"
Calcic	48-84"
aquic	30-84"

P. S. Control Section : *Ave. Clay %:* *Ave. Rock Frag %:*

Depth Range:

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	ARTRW	
widely	scattered Juniper & Pinyon	
	Brome	

MISCELLANEOUS FIELD NOTES / SKETCH :

clay too hard to dig below 72"

mollic episaturation 48

	Obser. Method	Depth (in) ~~(cm)~~	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-3"	A	cs	10YR 5/2	10YR 3/2	CL	—	2 m sbk 3 m gr	H	fr	ms	mP	—
2		3-12"	Bt1	cs	10YR 6/2	10YR 4/2	clay	—	2 m pr 3 m sbk	VH	fi	s	P	—
3		12-30"	Bt2	gs	10YR 6/2	10YR 4/2	clay	—	3 mc pr 2 m sbk	VH	fi	s	P	—
4		30-48	Bt3	cs	2.5Y 6/2	2.5Y 4/2	clay	—	3 m pr 2 m sbk	~~X~~H	vfi	vs	VP	16 f m distinct 7.5YR 5/6
5		48-84	Btk		2.5Y 6/2	2.5Y 4/2	clay	—	3 m pr 3 m sbk	XH	Xfi	vs	VP	7 f distinct 7.5YR 6/6
6														
7														
8														
9														
10														

Component Name:
Map Unit Symbol: 1
Date: Apr 5, 2007

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	2 vf f m	2 vf ft	7.8	e	30		
2	—	—	35 c LF PF/PO	2 vf f 1 m	1 vf t	8.2	e	40		
3	—	—	85 c LF PF/PO	1 vf f	—	8.3	e	50		
4	—	3 vf f CAM disseminated	90 c LF PF/PO	—	—	8.6	me	55		
5	—	10 f CAM 2 f Gyp Masses	95 c LF PF/PO	—	—	7.8	me/st	60		
6										
7										
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 49

DRAFT 3/2002

Series or Component Name:

Map Unit Symbol: 5

Photo #:

Classification: Lithic Ustorthent loamy, mix, super, calc, mesic

Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long

Date: Apr 5, 2006

Weather: High clouds

Temp.: Air: 60 Soil: Depth:

Latitude: ° ' " N

Longitude: ° ' " W

Datum: 1983

Location: Sec. T. R.

UTM: Zone: mE: mN:

Topo Quad:

Site ID: Yr: 07 State: UT County: KA Pedon #: 49

Soil Survey Area:

MLRA / LRU:

Transect: ID: Stop #: Interval:

Landscape: Ridge

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: S

Slope (%): 8-12

Slope Complexity: complex

Slope Shape: (Up & Dn / Across) Convex / Convex

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physio. Area:

Local Physio. Area:

Drainage: Well

Flooding: No

Ponding: No

Soil Moisture Status: S.M.

Permeability: K_{sat}: Mod

Land Cover / Use: PJ / Range

Parent Material: Residuum

Bedrock: Kind: sandstone Fract.: Hard.: Depth:

Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Sheet Degree: Mod.

Runoff: mod rapid

Surface Frag %: Kind: GR: 25 CB: 3 ST: 1 BD: 1 CN: FL:

Diagnostic Horz. / Prop.: Kind: Depth:
Lithic 10"+
Ochric

P. S. Control Section: Ave. Clay %: Ave. Rock Frag %:

Depth Range:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Pinyon	
	Ut Juniper	
	Black sage	
	Indian Ricegrass	

MISCELLANEOUS FIELD NOTES / SKETCH:

10% soils shallow to shallow

10% mod deep to sandstone

sandstone underlain by shale

49

Component Name: Hideout **Map Unit Symbol:** **Date:** Apr 5, 2002

	Obser. Method	Depth (in) ~~(cm)~~	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd %	Rock Frags Rnd	Rock Frags Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SS	0-3"	A	CS	2.5Y 6/4	2.5Y 5/4	GR SCL	GR 30			1 fm sbk 2 f gr	sh	vfr	ss	sp	—
2	SS	3-10"	C	as	2.5Y 5/4	2.5Y 4/4	GR CL	GR 25			M	sh	vfr	ss	sp	—
3	SS	10"+	R		sandstone											
4																
5																
6																
7																
8																
9																
10																

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	2vf 1fmc	2vf it	7.6	ST	28		
2	—	—	—	2vf 1fmc	1vf t	8.2	ST	32		
3										
4										
5										
6										
7										
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 50

DRAFT 3/2002

Series or Component Name:

Map Unit Symbol: 10

Photo #:

Classification: Aridic Ustorthent clayey, smectitic, super

Soil Moist. Regime (Tax.): Ustic Aridic

Describer(s): Roy Long

Date: Apr 5, 07

Weather: High Clouds

Temp.: Air: 52° Soil: Depth:

Latitude: ° ' " N

Longitude: ° ' " W

Datum:

Location: Sec. T. R.

UTM: Zone: mE: mN:

Topo Quad:

Site ID: Yr: 07 State: UT County: KA Pedon #: 50

Soil Survey Area:

MLRA / LRU:

Transect: ID: Stop #: Interval:

Landscape: Scarp

Landform:

Microfeature:

Anthro:

Elevation:

Aspect: WNW 292

Slope (%): 16

Slope Complexity: complex

Slope Shape: (Up & Dn / Across) Convex / Convex

Hillslope Profile Position:

Geom. Component:

Microrelief:

Physio. Division:

Physio. Province:

Physio. Section:

State Physio. Area:

Local Physio. Area:

Drainage: Somewhat Well

Flooding: No

Ponding: NO

Soil Moisture Status: S. M.

Permeability: K_{sat}: Mod slow

Land Cover / Use: Range

Parent Material: Residuum

Bedrock: Kind: Shale Fract.: Hard.: Depth:

Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Flow Pattern Degree: Mod

Runoff: Mod Rapid

Surface Frag %: GR: — CB: — ST: — BD: — CN: — FL: — Kind:

Diagnostic Horz. / Prop.: Kind: Depth: Paralithic 19" Ochric

P. S. Control Section: Depth Range: 10-19"

Ave. Clay %: 55% (las)

Ave. Rock Frag %: 0

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	Ut Juniper	
	Pinyon Pine	
	Black sage	
	Indian Ricegrass	

MISCELLANEOUS FIELD NOTES / SKETCH :

	Component Name:	Cannonville		Map Unit Symbol:		Date:	Apr 5, 2007

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SS	0-4	A	CS	2.5Y6/2	2.5Y4/2	C	—	1 m sbk / 2 f gr	sh	vfr	s	s	—
2	↓	4-11	C1	CS	2.5Y6/2	2.5Y4/2	C	—	m	h	fi	s	s	—
3		11-19	C2	CS	2.5Y6/2	2.5Y4/2	C	—	m (shale structure)	h	fi	s	p	—
4		19+	Cr											
6														
7														
8														
9														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	2vf 1fm	2vf i t	7.8	ST	45		
2	—	—	—	2vf 1fm	1vf t	8.0	ST	55		
3	—	—	—	1vff	1vf t	8.4	ve	50		
4										
5										
6										
7										
8										
9										
10										

Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphohorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
LOF-1 0-6"	7.3	1.56	0.23	25	39	36	CL	20.1	50.2	0.19	3.6	1.9	0.16	22.6	†	†	9.03	2.09	0.55	2.20	1.99	2.86	3.76
LOF-1 6-12"	8.3	0.52	1.15	26	38	36	CL	24.3	54.4	0.19	1.8	0.9	0.25	27.1	†	†	2.63	1.09	1.57	0.18	<0.02	0.18	3.45
LOF-1 12-24"	8.5	0.42	2.91	18	40	42	SiC	16.5	54.8	0.20	1.6	0.8	0.29	26.6	†	†	1.07	0.59	2.65	0.07	0.23	0.93	2.72
LOF-1 24-42"	8.7	0.90	4.02	13	41	46	SiC	11.3	60.8	0.20	1.5	0.8	0.28	27.1	†	†	1.61	0.87	4.47	0.14	0.34	<0.01	4.08
LOF-1 42-60"	8.4	4.75	12.3	19	39	42	C	17.1	65.4	0.19	1.1	0.6	0.29	28.3	†	†	6.45	7.65	32.7	0.45	0.21	0.07	1.67
LOF-2 0-7"	7.6	0.47	0.16	32	37	31	CL	14.9	43.3	0.19	2.7	1.4	0.17	18.6	0.27	<0.02	4.93	1.26	0.29	0.65	1.58	9.55	3.13
LOF-2 7-12"	7.7	0.31	0.19	34	34	32	CL	22.3	44.8	0.19	2.4	1.3	0.23	20.1	0.24	<0.02	2.07	0.68	0.22	0.19	0.55	0.40	2.19
LOF-2 12-24"	7.8	0.25	0.62	14	40	46	SiC	12.4	60.2	0.20	1.8	0.9	0.28	26.7	0.30	<0.02	1.29	0.57	0.59	0.09	0.31	<0.01	2.19
LOF-2 24-48"	8.0	0.32	2.12	22	37	41	C	20.2	67.7	0.19	1.7	0.9	0.23	26.9	0.45	<0.02	0.77	0.53	1.71	0.07	0.88	0.04	1.88
LOF-2 48-72"	7.8	7.38	7.27	14	43	43	SiC	11.3	66.7	0.20	1.1	0.6	0.30	27.5	1.08	0.09	23.8	24.9	35.8	0.50	1.07	0.40	1.25
LOF-2 72-96"	7.8	7.17	7.75	18	35	47	C	13.0	62.9	0.19	1.1	0.6	0.26	21.0	0.61	0.12	21.6	26.3	37.9	0.47	13.1	0.76	0.94
LOF-3 0-4"	8.1	0.82	0.27	32	42	26	L	17.5	47.7	0.16	3.9	2.1	0.16	20.3	†	†	5.98	1.58	0.53	1.02	10.6	<0.01	5.64
LOF-3 4-11"	8.3	0.43	0.25	24	48	28	CL	15.9	51.8	0.19	2.9	1.5	0.30	20.4	†	†	3.19	0.73	0.36	0.27	1.07	0.90	3.55
LOF-3 11-19"	8.1	0.41	0.32	16	50	34	SiCL	14.0	42.7	0.18	2.3	1.2	0.35	24.2	†	†	2.86	0.88	0.44	0.22	0.43	0.56	2.51
LOF-3 19-33"	8.4	0.71	4.05	17	43	40	SiC	16.1	53.5	0.20	2.2	1.2	0.30	27.2	†	†	1.67	0.89	4.58	0.15	0.32	0.07	3.87
LOF-4 0-5"	7.8	0.62	0.29	12	46	42	SiC	9.1	52.6	0.20	3.5	1.8	0.22	22.5	†	†	4.54	1.04	0.49	0.26	4.16	0.79	3.03
LOF-4 5-10"	7.7	0.31	0.26	14	46	40	SiC	11.0	53.0	0.20	2.8	1.5	0.30	24.4	†	†	2.28	0.63	0.32	0.08	0.66	9.76	2.72
LOF-4 10-19"	7.8	0.33	0.60	12	43	45	SiC	10.5	53.9	0.20	2.1	1.1	0.29	25.3	†	†	2.00	0.78	0.71	0.08	0.53	0.64	2.40
LOF-4 19-31"	7.9	0.29	1.16	13	43	44	SiC	11.3	53.6	0.20	1.8	0.9	0.29	25.3	†	†	1.12	0.52	1.05	0.06	0.40	0.67	1.88
LOF-4 31-50"	7.8	4.06	5.43	19	39	42	C	16.3	59.8	0.19	1.1	0.6	0.29	27.6	†	†	16.3	12.4	20.5	0.51	1.06	0.43	1.46
RDV-5 0-5"	8.1	0.54	0.27	38	44	18	L	22.6	42.7	0.16	3.6	1.9	0.20	25.7	†	†	3.72	0.90	0.41	0.36	6.14	10.4	3.97
RDV-5 5-10"	8.1	0.50	0.19	33	47	20	L	18.9	39.3	0.16	3.0	1.6	0.29	26.4	†	†	3.98	0.95	0.30	0.23	<0.02	1.82	4.08
RDV-5 10-25"	8.4	0.37	0.31	54	32	14	SL	19.0	32.3	0.12	1.1	0.6	0.23	31.1	†	†	2.37	0.89	0.40	0.22	0.22	16.4	2.72
RDV-5 25-48"	8.8	0.72	7.45	16	72	12	SiL	13.4	56.0	0.18	1.7	0.9	#N/A	28.0	†	†	0.84	0.60	6.33	0.11	0.16	1.48	4.91
RDV-5 48-60"	9.0	3.37	24.0	31	47	22	L	26.6	83.6	0.16	1.3	0.7	0.32	26.5	†	†	1.26	1.76	29.5	0.20	0.22	1.62	6.06
RDV-6 0-6"	8.1	0.52	0.34	82	12	6	LS	21.0	27.9	0.08	1.1	0.6	0.04	18.4	†	†	2.99	1.06	0.48	0.77	1.68	9.41	3.97
RDV-6 6-12"	8.3	0.31	0.25	80	14	6	LS	18.5	29.9	0.08	0.7	0.4	0.13	20.6	†	†	2.13	0.47	0.28	0.14	0.24	0.67	2.51
RDV-6 12-24"	8.0	0.64	0.20	45	37	18	L	17.8	35.4	0.16	2.6	1.4	0.25	28.9	†	†	4.52	1.68	0.36	0.33	<0.02	0.56	4.18
RDV-6 24-34"	8.3	0.40	0.30	69	23	8	SL	35.5	29.7	0.12	0.7	0.4	0.19	29.2	†	†	2.43	1.35	0.41	0.18	0.07	0.56	2.93
RDV-6 34-60"	8.5	0.83	3.43	19	41	40	SiC	15.5	52.9	0.20	1.8	0.9	0.30	25.9	†	†	1.83	2.24	4.89	0.19	0.03	<0.01	5.96
RDV-7 0-6"	7.5	0.58	0.13	26	38	36	CL	20.4	62.9	0.19	4.4	2.3	0.14	10.6	†	†	3.93	1.17	0.20	0.28	2.19	12.5	3.76
RDV-7 6-12"	7.6	0.36	0.22	18	38	44	C	11.9	57.1	0.19	3.0	1.6	0.26	13.2	†	†	2.37	0.78	0.27	0.09	0.28	7.78	2.82
RDV-7 12-24"	8.0	0.24	1.30	16	37	47	C	13.6	55.3	0.19	1.8	0.9	0.26	21.2	†	†	0.82	0.44	1.04	0.04	0.40	0.73	2.09
RDV-7 24-60"	8.0	1.40	5.18	22	34	44	C	20.8	63.8	0.19	1.4	0.7	0.26	23.4	†	†	2.65	2.00	7.90	0.11	0.30	0.46	1.78
1YR-8 0-8"	8.0	0.68	0.18	36	34	30	CL	19.7	51.5	0.19	5.8	3.1	0.12	5.1	†	†	3.68	2.81	0.33	0.45	3.82	10.9	5.54
1YR-8 8-14"	8.1	0.53	0.18	38	32	30	CL	17.2	43.1	0.19	2.1	1.1	0.23	16.3	†	†	3.22	1.63	0.29	0.34	0.05	0.07	2.93
1YR-8 14-22"	8.5	0.40	0.43	48	30	22	L	19.5	35.8	0.16	1.1	0.6	0.22	27.3	†	†	1.77	1.31	0.53	0.37	0.17	0.21	2.30
1YR-8 22-45"	8.9	0.44	0.28	42	42	16	L	23.9	37.6	0.16	0.7	0.4	0.33	30.8	†	†	0.71	3.05	0.39	0.45	0.50	2.51	3.55
1YR-8 45-65"	9.0	0.49	0.28	79	13	8	LS	19.8	27.4	0.08	0.4	0.2	0.12	19.3	†	†	0.70	3.46	0.40	0.41	0.27	0.18	3.66
1YR-8 65-85"	8.9	0.56	0.65	80	12	8	LS	17.9	25.9	0.08	0.3	0.2	0.11	20.4	†	†	1.24	3.81	1.03	0.19	0.20	0.10	4.18

Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phospohorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
1YR-9A 0-12"	9.0	0.91	0.30	60	32	8	SL	26.6	47.0	0.12	4.7	2.5	0.11	26.1	†	†	0.98	7.93	0.62	0.65	4.23	10.0	6.90
1YR-9A 12-24"	9.1	0.83	0.23	68	22	10	SL	22.2	32.8	0.12	1.4	0.7	0.17	22.0	†	†	0.44	7.78	0.46	0.71	0.21	2.02	7.94
1YR-9A 24-42"	9.6	1.26	3.71	68	22	10	SL	20.4	26.4	0.12	0.3	0.2	0.18	23.6	†	†	0.76	6.48	7.06	0.34	0.13	2.22	10.6
1YR-9A 42-70"	9.4	0.90	3.19	69	21	10	SL	26.7	27.7	0.12	0.3	0.2	0.17	23.5	†	†	0.63	3.77	4.73	0.16	0.26	1.88	5.22
1YR-9A 70-100"	8.5	1.31	1.48	30	31	39	CL	27.3	68.6	0.19	0.5	0.3	0.22	9.8	†	†	1.72	8.32	3.31	0.19	0.29	0.82	2.82
1YR-9B 0-6"	8.0	0.62	0.07	44	32	24	L	14.5	63.0	0.16	6.1	3.2	0.09	18.6	†	†	2.19	3.21	0.12	0.74	1.73	1.44	4.49
1YR-9B 6-14"	8.2	0.34	0.21	52	25	23	SCL	18.1	42.4	0.17	3.4	1.8	0.22	15.3	†	†	1.17	1.67	0.25	0.30	0.91	<0.01	2.30
1YR-9B 14-28"	8.5	0.88	0.57	64	22	14	SL	9.7	35.7	0.12	0.9	0.5	0.17	21.2	†	†	1.16	5.71	1.06	0.72	0.50	<0.01	3.03
1YR-9B 28-48"	8.3	0.76	0.70	54	30	16	SL	16.0	31.0	0.12	0.4	0.2	0.22	26.4	†	†	1.49	4.64	1.23	0.37	0.48	<0.01	2.40
1YR-10 0-7"	7.8	0.46	0.05	36	38	26	L	17.9	46.4	0.16	3.9	2.1	0.15	19.2	0.29	<0.02	3.39	0.89	0.08	0.30	3.15	7.45	4.18
1YR-10 7-13"	7.7	0.40	0.06	26	48	26	L	12.3	44.4	0.16	2.4	1.3	0.29	13.9	0.31	<0.02	2.58	0.80	0.08	0.24	0.46	0.67	3.13
1YR-10 13-26"	7.9	0.34	0.07	14	52	34	SiCL	9.4	41.7	0.18	1.6	0.8	0.37	27.8	0.20	<0.02	2.00	0.95	0.09	0.21	0.44	0.37	3.03
1YR-10 26-44"	8.3	0.36	0.16	30	36	34	CL	29.1	45.4	0.19	1.0	0.5	0.25	35.5	0.37	<0.02	0.83	2.50	0.20	0.08	0.15	<0.01	3.55
1YR-10 44-68"	8.5	0.34	0.49	14	54	32	SiCL	7.0	46.0	0.18	0.5	0.3	0.42	34.4	0.24	<0.02	0.71	2.07	0.58	0.05	0.19	<0.01	2.51
1YR-10 68-84"	8.4	0.46	0.48	60	30	10	SL	24.5	28.0	0.12	0.2	0.1	0.24	26.4	0.07	<0.02	0.77	2.96	0.66	0.05	0.32	0.67	2.93
1YR-11 0-5"	8.0	0.48	0.19	72	19	9	SL	19.9	36.3	0.12	2.4	1.3	0.07	1.4	†	†	2.44	1.84	0.28	0.39	1.58	8.21	3.76
1YR-11 5-16"	8.2	0.50	0.28	69	17	14	SL	20.0	31.3	0.12	1.7	0.9	0.13	4.2	†	†	2.76	1.42	0.40	0.36	0.13	0.82	3.55
1YR-11 16-32"	8.3	0.38	0.22	72	18	10	SL	16.1	27.9	0.12	0.9	0.5	0.15	14.4	†	†	1.89	0.87	0.26	0.37	0.20	1.53	3.13
1YR-11 32-48"	8.3	0.41	0.26	79	13	8	LS	17.1	27.3	0.08	0.5	0.3	0.12	19.6	†	†	1.90	1.06	0.32	0.29	0.23	0.44	2.93
1YR-11 48-72"	8.6	0.33	0.24	78	14	8	LS	18.4	28.1	0.08	0.3	0.2	0.13	21.7	†	†	1.44	0.96	0.27	0.12	0.12	2.20	2.82
1YR-11 72-90"	8.7	0.29	0.35	89	7	4	S	14.1	23.9	0.05	0.2	0.1	0.08	18.2	†	†	1.37	1.15	0.39	0.13	0.10	4.93	2.19
1YR-12 0-5"	7.8	0.38	0.13	32	40	28	CL	28.9	46.8	0.19	2.3	1.2	0.20	0.1	†	†	2.66	0.91	0.17	0.20	0.87	7.33	3.03
1YR-12 5-10"	7.8	0.29	0.59	29	39	32	CL	22.2	50.6	0.19	1.9	1.0	0.26	9.3	†	†	1.79	0.69	0.66	0.08	0.67	0.22	2.51
1YR-12 10-26"	8.4	0.21	2.20	16	40	44	SiC	13.8	58.6	0.20	0.7	0.4	0.30	18.8	†	†	0.50	0.24	1.34	0.04	0.94	<0.01	1.99
1YR-12 26-44"	8.3	0.86	6.84	46	19	35	SC	45.0	93.0	0.19	0.7	0.4	0.19	11.9	†	†	0.91	0.57	5.89	0.08	0.20	<0.01	1.67
SP-13 0-6"	8.5	0.72	0.17	59	23	18	SL	15.8	34.1	0.12	2.7	1.4	0.08	19.7	†	†	4.77	2.10	0.31	0.90	3.78	39.5	5.64
SP-13 6-12"	8.2	0.52	0.22	23	51	26	SiL	12.7	43.3	0.18	1.7	0.9	0.32	27.9	†	†	2.64	1.72	0.33	0.41	0.18	3.83	3.87
SP-13 12-24"	8.4	0.55	0.23	14	44	42	SiC	9.1	62.3	0.20	2.9	1.5	0.29	26.9	†	†	1.67	3.09	0.35	0.26	0.50	0.70	3.87
SP-13 24-48"	8.5	0.47	0.29	22	46	32	CL	9.5	46.3	0.19	1.2	0.6	0.31	32.2	†	†	0.91	3.26	0.42	0.12	0.46	0.44	3.55
SP-13 48-60"	8.8	0.31	0.51	33	39	28	CL	13.4	46.1	0.19	1.8	0.9	0.27	29.2	†	†	0.53	3.00	0.67	0.10	0.17	<0.01	1.67
SP-13 60-72"	8.9	1.46	2.20	62	14	24	SCL	19.2	35.6	0.17	1.2	0.6	0.18	20.6	†	†	1.64	8.30	4.90	0.14	0.23	0.99	7.00
SP-13 72-84"	8.7	2.20	2.36	44	36	20	L	18.5	33.5	0.16	0.5	0.3	0.25	28.7	†	†	2.07	15.5	7.00	0.20	0.29	0.73	3.03
SP-14 0-6"	8.7	0.54	0.14	8	48	44	SiC	5.3	58.6	0.20	4.0	2.1	0.21	7.5	†	†	2.34	2.42	0.22	0.35	0.38	8.92	4.81
SP-14 6-13"	7.8	0.36	0.22	8	48	44	SiC	5.7	62.4	0.20	2.1	1.1	0.31	19.9	†	†	1.08	2.05	0.27	0.17	0.58	2.94	2.61
SP-14 13-28"	8.1	0.53	0.49	23	50	27	CL	21.4	50.7	0.19	0.7	0.4	0.36	44.0	†	†	0.41	3.76	0.70	0.14	0.17	4.40	4.28
SP-14 28-48"	8.7	0.77	1.35	40	43	17	L	33.6	43.7	0.16	0.4	0.2	0.34	39.3	†	†	0.49	5.04	2.24	0.10	0.21	2.67	3.55
SP-14 48-70"	8.8	0.80	1.60	21	40	39	CL	5.6	41.7	0.19	0.4	0.2	0.24	30.9	†	†	0.54	4.79	2.61	0.11	0.41	3.54	5.12
SP-14 70-90"	8.5	0.89	1.28	21	47	32	CL	17.7	55.0	0.19	0.6	0.3	0.32	31.5	†	†	0.74	3.87	1.94	0.11	0.64	0.31	2.61

Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphohorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
SP-15 0-8"	8.0	0.54	0.08	52	32	16	SL	24.2	46.5	0.12	3.5	1.8	0.16	10.8	†	†	2.01	2.43	0.12	0.41	0.68	4.82	4.70
SP-15 8-20"	8.5	0.50	0.11	50	32	18	L	24.3	35.2	0.16	0.8	0.4	0.21	27.6	†	†	0.70	3.80	0.17	0.31	0.16	1.80	4.60
SP-15 20-37"	8.7	0.78	0.72	51	34	15	L	23.7	30.7	0.16	0.5	0.3	0.27	31.9	†	†	0.64	5.91	1.30	0.21	0.58	1.56	4.08
SP-15 37-58"	8.6	1.56	1.81	39	43	18	L	22.7	36.9	0.16	0.4	0.2	0.33	33.4	†	†	0.90	12.0	4.60	0.18	0.32	1.20	3.03
SP-15 58-73"	8.4	3.35	1.92	74	18	8	SL	19.2	27.2	0.12	0.1	0.1	0.15	26.3	†	†	2.52	33.5	8.14	0.26	0.36	0.82	1.99
SP-15 73-96"	8.3	1.77	1.24	52	34	14	SL	25.3	30.2	0.12	0.3	0.2	0.26	28.1	†	†	1.70	12.4	3.30	0.19	0.54	<0.01	2.82
SP-16 0-8"	8.3	0.58	0.31	19	45	36	SiCL	15.1	64.5	0.18	4.8	2.5	0.21	9.6	†	†	3.08	1.84	0.49	0.42	1.19	18.3	4.81
SP-16 8-18"	8.2	0.60	0.25	12	44	44	SiC	10.8	61.9	0.20	1.9	1.0	0.30	24.5	†	†	2.00	2.77	0.39	0.28	0.21	4.70	3.55
SP-16 18-36"	8.7	0.45	0.38	20	52	28	CL	16.2	50.6	0.19	0.6	0.3	0.37	38.8	†	†	0.68	3.12	0.53	0.19	0.24	6.45	**4.18**
SP-16 36-56"	9.0	0.34	0.56	14	58	28	SiCL	12.4	52.2	0.18	0.6	0.3	0.46	40.1	†	†	0.45	3.38	0.77	0.14	0.23	5.10	3.66
SP-16 56-68"	8.9	0.60	0.78	50	36	14	L	21.6	36.3	0.16	0.3	0.2	0.30	28.1	†	†	0.52	4.30	1.21	0.16	0.30	2.83	**4.08**
SP-16 68-96"	8.9	0.53	0.81	23	49	28	CL	17.0	55.3	0.19	0.6	0.3	0.36	31.0	†	†	1.00	3.49	1.21	0.18	0.24	1.25	4.81
WRD-17 0-9"	7.8	0.43	0.11	22	42	36	CL	11.0	49.8	0.19	4.6	2.4	0.22	25.4	†	†	1.74	1.11	0.14	0.51	1.09	8.05	3.34
WRD-17 9-18"	8.0	0.24	0.17	34	34	32	CL	16.6	39.6	0.19	2.0	1.1	0.20	25.3	†	†	1.14	0.63	0.16	0.23	0.28	1.26	1.78
WRD-17 18-30"	8.0	0.32	0.11	44	34	22	L	17.3	38.5	0.16	1.6	0.8	0.23	25.3	†	†	0.99	0.69	0.10	0.15	0.85	2.49	2.61
WRD-17 30-45"	8.1	0.28	0.13	36	37	27	CL	17.5	39.3	0.19	0.8	0.4	0.27	29.5	†	†	0.59	0.56	0.10	0.05	0.10	2.82	2.40
WRD-17 45-60"	8.2	0.34	0.22	24	44	32	CL	14.8	40.0	0.19	0.8	0.4	0.31	33.5	†	†	1.17	1.64	0.26	0.07	0.11	0.13	2.19
WRD-17 60-80"	8.0	0.82	0.37	18	40	42	SiC	17.0	61.3	0.20	1.1	0.6	0.30	33.0	†	†	2.86	4.00	0.69	0.14	0.59	0.70	1.88
WRD-18A 0-7"	7.7	0.61	0.10	41	33	26	L	18.3	46.0	0.16	3.9	2.1	0.17	20.2	†	†	3.08	1.36	0.15	0.59	0.57	1.95	3.97
WRD-18A 7-15"	8.0	0.33	0.12	43	33	24	L	20.0	43.4	0.16	2.1	1.1	0.19	24.7	†	†	1.45	1.00	0.13	0.28	0.68	0.61	2.30
WRD-18A 15-30	8.1	0.51	0.29	60	23	17	SL	17.6	31.1	0.12	0.7	0.4	0.15	28.2	†	†	1.97	2.13	0.41	0.09	0.08	2.43	2.30
WRD-18A 30-45	8.0	0.67	0.30	24	41	35	CL	13.8	52.4	0.19	1.5	0.8	0.28	29.3	†	†	2.66	3.06	0.51	0.12	0.13	0.34	1.88
WRD-18A 45-60	7.9	0.44	0.36	57	23	20	SCL	18.4	36.1	0.17	0.7	0.4	0.23	25.8	†	†	1.67	1.63	0.47	0.06	0.16	<0.01	2.09
WRD-18B 0-9"	8.2	0.35	0.18	34	40	26	L	11.4	43.4	0.16	3.6	1.9	0.16	23.8	0.39	<0.02	4.56	1.75	0.31	0.65	3.96	18.6	**5.54**
WRD-18B 9-19"	8.3	0.61	0.17	50	30	20	L	16.2	41.3	0.16	1.8	0.9	0.22	20.3	0.25	<0.02	3.45	1.56	0.27	0.80	0.31	2.89	4.60
WRD-18B 19-34	8.5	0.52	0.21	44	38	18	L	21.0	35.8	0.16	1.2	0.6	0.28	27.5	0.18	<0.02	2.41	2.17	0.31	0.18	0.09	5.50	**3.13**
WRD-18B 34-54	8.7	0.38	0.27	21	47	32	CL	13.4	45.5	0.19	1.4	0.7	0.31	29.0	0.33	<0.02	1.63	1.70	0.35	0.12	0.50	0.93	2.61
WRD-18B 54-72	8.6	0.57	0.31	22	44	34	CL	11.8	49.6	0.19	1.1	0.6	0.29	28.3	0.29	<0.02	1.92	2.53	0.46	0.18	0.10	1.19	**3.76**
WRD-18B 72-96	8.6	1.46	0.56	48	32	20	L	21.2	34.7	0.16	0.5	0.3	0.25	23.1	0.19	<0.02	2.97	11.0	1.48	0.19	0.45	0.21	8.99
WRD-19 0-6"	8.0	0.91	0.15	34	42	24	L	16.5	48.5	0.16	4.9	2.6	0.15	20.1	†	†	4.87	2.07	0.28	1.72	2.77	12.9	6.69
WRD-19 6-12"	8.2	0.65	0.20	32	36	32	CL	13.1	44.1	0.19	3.0	1.6	0.23	17.4	†	†	3.43	1.45	0.30	1.14	1.85	8.32	**4.39**
WRD-19 12-24"	8.3	0.53	0.23	34	36	30	CL	15.8	40.8	0.19	2.0	1.1	0.25	23.5	†	†	2.85	1.21	0.32	0.87	0.67	1.99	2.51
WRD-19 24-37"	8.5	0.55	0.19	49	29	22	L	24.5	40.8	0.16	1.9	1.0	0.21	24.6	†	†	2.71	1.11	0.26	0.76	0.35	0.99	3.13
WRD-19 37-51"	8.4	0.57	0.18	60	26	14	SL	24.2	34.1	0.12	1.2	0.6	0.19	22.7	†	†	2.94	1.39	0.27	0.59		1.53	2.40
WRD-19 51-68"	8.5	0.48	0.26	66	22	12	SL	17.5	29.1	0.12	0.8	0.4	0.17	19.7	†	†	2.07	1.87	0.36	0.22	0.41	1.71	3.45
WRD-19 68-90"	8.7	0.37	0.30	71	19	10	SL	17.6	26.0	0.12	0.6	0.3	0.16	19.8	†	†	1.11	2.06	0.37	0.10	0.18	1.88	2.93
WRD-20 0-6"	7.9	0.57	0.08	39	37	24	L	15.4	53.3	0.16	6.6	3.5	0.20	18.4	†	†	2.75	1.83	0.12	0.58	0.19	0.94	4.49
WRD-20 6-13"	7.8	0.56	0.10	41	29	30	CL	17.7	47.6	0.19	2.4	1.3	0.16	20.8	†	†	2.47	1.47	0.14	0.67	0.12	1.62	3.13
WRD-20 13-28"	8.1	0.27	0.14	69	21	10	SL	18.6	24.1	0.12	0.6	0.3	0.15	25.4	†	†	1.22	0.63	0.13	0.32	0.07	0.37	2.30
WRD-20 28-54"	8.0	0.32	0.07	79	14	7	LS	15.8	25.4	0.08	0.2	0.1	0.03	21.7	†	†	1.40	0.76	0.07	0.42	0.03	0.94	2.72
WRD-20 54-72"	8.1	0.27	0.23	45	29	26	L	13.9	38.5	0.16	1.1	0.6	0.22	24.3	†	†	1.18	0.87	0.24	0.21	0.53	1.23	2.51
WRD-20 72-96"	8.2	0.32	0.16	82	13	5	LS	17.6	28.3	0.08	0.3	0.2	0.02	16.5	†	†	0.97	1.23	0.16	0.28	0.29	0.28	2.51

Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phospohorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
WRD-21 0-8"	8.4	0.46	0.19	61	11	28	SCL	18.6	30.6	0.17	2.0	1.1	0.16	21.2	†	†	2.94	0.74	0.26	0.48	2.30	7.11	3.76
WRD-21 8-18"	8.1	0.66	0.17	59	11	30	SCL	47.0	46.0	0.17	3.2	1.7	0.15	29.8	†	†	4.12	1.78	0.29	0.20	0.75	0.87	4.08
WRD-21 18-36"	8.4	0.49	0.22	68	18	14	SL	18.2	30.5	0.12	1.2	0.6	0.14	20.3	†	†	2.64	1.61	0.33	0.10	0.26	2.48	2.72
WRD-21 36-50"	8.7	0.48	0.24	67	25	8	SL	14.2	28.6	0.12	0.9	0.5	0.20	21.6	†	†	2.71	1.62	0.36	0.15	0.35	0.79	3.34
WRD-21 50-62"	8.7	0.37	0.25	69	23	8	SL	14.8	27.9	0.12	1.0	0.5	0.18	16.8	†	†	1.91	1.24	0.32	0.12	0.46	2.66	2.51
WRD-21 62-96"	8.7	0.32	0.25	68	20	12	SL	23.7	26.7	0.12	0.7	0.4	0.06	20.7	†	†	1.34	1.60	0.30	0.09	0.17	1.07	2.51
WRD-22 0-6"	7.7	0.40	0.07	63	23	14	SL	25.0	36.6	0.12	1.8	0.9	0.26	20.2	†	†	2.16	0.88	0.08	0.35	1.94	4.52	3.13
WRD-22 6-15"	7.7	0.34	0.13	19	42	39	SiCL	7.0	48.0	0.18	3.7	1.9	0.30	23.8	†	†	1.85	0.83	0.16	0.19	0.76	9.01	2.72
WRD-22 15-28"	8.0	0.29	0.11	47	27	26	SCL	5.6	34.9	0.17	1.2	0.6	0.22	18.9	†	†	1.64	0.80	0.13	0.18	0.80	0.31	2.72
WRD-22 28-48"	8.0	0.25	0.14	65	21	14	SL	13.7	28.0	0.12	0.8	0.4	0.16	17.9	†	†	1.18	0.64	0.13	0.16	0.29	0.13	2.30
WRD-22 48-60"	8.0	0.27	0.10	65	21	14	SL	14.5	30.1	0.12	1.0	0.5	0.16	17.5	†	†	1.34	0.67	0.10	0.16	0.35	0.07	2.30
WRD-22 60-84"	8.2	0.30	0.09	74	18	8	SL	21.8	27.3	0.12	0.5	0.3	0.15	21.0	†	†	1.08	0.96	0.09	0.25	0.57	0.28	2.51
WRD-23 0-6"	7.7	0.60	0.05	31	38	31	CL	12.5	48.4	0.19	4.9	2.6	0.22	21.4	†	†	3.20	1.35	0.07	0.53	1.43	8.26	4.60
WRD-23 6-12"	7.9	0.38	0.13	36	33	31	CL	14.7	44.6	0.19	2.9	1.5	0.19	23.6	†	†	1.97	0.91	0.15	0.30	0.31	1.74	3.34
WRD-23 12-22"	7.9	0.35	0.12	38	34	28	CL	12.5	41.0	0.19	1.8	0.9	0.23	25.6	†	†	1.76	0.92	0.14	0.16	0.29	1.09	3.24
WRD-23 22-40"	8.0	0.24	0.16	51	30	19	L	17.2	33.2	0.16	0.7	0.4	0.22	29.8	†	†	1.12	0.77	0.15	0.06	0.21	1.03	2.30
WRD-23 40-62"	8.2	0.23	0.24	31	44	25	L	20.0	38.6	0.16	0.6	0.3	0.31	35.3	†	†	1.01	0.94	0.24	0.06	0.89	0.28	1.99
WRD-23 62-80"	8.1	0.44	0.48	18	41	41	SiC	14.0	43.9	0.20	0.8	0.4	0.31	30.4	†	†	1.61	1.95	0.64	0.14	0.35	1.65	2.09
DAH-24 0-5"	7.6	0.26	0.53	34	19	47	C	33.0	73.6	0.19	1.3	0.7	0.17	2.9	0.23	<0.02	1.25	0.58	0.50	0.09	4.14	2.25	1.57
DAH-24 5-17"	7.7	0.43	1.32	42	14	44	C	41.4	84.1	0.19	1.2	0.6	0.19	8.7	0.42	<0.02	1.62	0.65	1.40	0.09	0.19	0.16	1.88
DAH-24 17-32"	8.1	7.79	10.0	38	17	45	C	36.5	91.2	0.19	0.9	0.5	0.20	5.0	0.73	<0.02	18.7	30.7	49.9	0.54	0.09	<0.01	1.88
DAH-25 0-5"	6.4	0.21	0.55	32	28	40	C	21.1	58.5	0.19	3.3	1.7	0.25	1.7	†	†	0.98	0.62	0.49	0.08	3.85	6.80	0.52
DAH-25 5-13"	7.0	0.33	0.21	30	23	47	C	21.6	80.6	0.19	2.4	1.3	0.20	30.3	†	†	1.90	0.68	0.23	0.13	0.20	0.19	1.36
DAH-25 13-20"	7.2	0.28	0.23	30	24	46	C	20.7	73.5	0.19	2.1	1.1	0.19	39.4	†	†	1.44	0.44	0.22	0.12	0.29	1.32	1.88
DAH-25 20-32"	7.7	0.26	0.25	48	19	33	SCL	37.6	54.1	0.17	1.2	0.6	0.19	3.8	†	†	1.34	0.52	0.25	0.09	0.15	0.43	1.88
SP-28 0-8"	7.7	0.47	0.65	7	38	55	C		60.2	0.12	2.5	1.3		18.9	†	†	2.8	2.3	1.0	1.00	3.9	<5	†
SP-28 8-24"	8.0	0.48	1.50	9	34	57	C		65.4	0.12	1.4	0.7		17.6	†	†	1.8	2.4	2.2	0.77	1.6	<5	†
SP-28 24-48	8.1	5.94	5.50	4	36	60	C		72.6	0.11	1.0	0.5		18.5	†	†	13	42	29	0.77	2.8	<5	†
SP-35 0-9"	7.7	0.56	0.11	12	44	44	SiC		55.4	0.14	4.3	2.3		16.7	†	†	4.0	2.7	0.20	1.80	5.1	45	†
SP-35 9-19"	7.9	0.44	0.12	16	40	44	SiC		54.6	0.14	1.8	0.9		17.4	†	†	2.4	2.3	0.19	1.60	1.1	25	†
SP-35 19-30"	8.2	0.40	0.22	51	27	22	SCL		31.5	0.12	1.2	0.6		15.0	†	†	1.5	1.8	0.28	1.10	1.1	5	†
SP-35 30-45"	8.4	0.37	0.22	59	27	14	SL		30.5	0.10	0.8	0.4		17.7	†	†	0.98	1.4	0.23	0.70	1.1	<5	†
SP-35 45-70"	8.8	0.46	0.37	42	39	19	L		37.3	0.14	0.9	0.5		18.0	†	†	0.73	1.4	0.37	1.30	1.0	<5	†
SP-37 0-6"	7.8	0.51	0.08	38	30	32	CL		46.7	0.13	4.0	2.1		4.5	†	†	5.1	2.1	0.16	0.83	3.9	10	†
SP-37 6-12"	7.7	0.44	0.09	48	23	29	SCL		45.4	0.12	2.9	1.5		7.5	†	†	4.2	1.8	0.16	0.71	6.5	<5	†
SP-37 12-24"	8.0	0.29	0.13	56	24	20	SL-SCL		38.7	0.11	3.0	1.6		11.1	†	†	2.3	1.4	0.18	0.35	1.9	<5	†
SP-37 24-38"	8.2	0.25	0.14	71	18	11	SL		35.2	0.08	0.7	0.4		15.3	†	†	1.6	1.7	0.18	0.10	2.0	<5	†
SP-37 38-58"	8.2	0.27	0.34	73	18	9	SL		30.3	0.07	0.5	0.2		17.3	†	†	1.5	2.0	0.44	0.07	1.5	<5	†
SP-38 0-6"	8.0	0.47	0.09	12	44	44	SiC		69.9	0.14	6.2	3.3		24.7	†	†	3.2	3.4	0.17	0.74	2.7	8	†
SP-38 6-12"	8.3	0.33	0.15	2	47	51	SiC		81.8	0.13	3.4	1.8		17.8	†	†	1.5	3.4	0.23	0.42	1.6	<5	†
SP-38 12-20"	8.5	0.49	0.39	11	46	43	SiC		71.1	0.15	1.9	1.0		28.3	†	†	1.3	5.2	0.70	0.23	1.4	<5	†
SP-38 20-24"	8.3	0.57	0.44	10	42	48	SiC		71.5	0.14	1.1	0.6		44.5	†	†	1.8	5.6	0.84	0.21	3.0	<5	†

Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phospohorus	Alkalinity
units		dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
SP-39 0-6"	7.8	0.32	0.19	36	33	31	CL		43.7	0.14	2.3	1.2		8.5	†	†	3.1	1.2	0.27	0.45	2.1	6	†
SP-39 6-12"	7.8	0.38	0.21	38	30	32	CL		41.9	0.13	2.4	1.3		7.9	†	†	3.9	1.5	0.34	0.45	1.7	<5	†
SP-39 12-24"	8.0	0.23	0.24	62	20	18	SL		35.3	0.09	1.2	0.6		13.9	†	†	2.2	0.98	0.30	0.17	1.2	<5	†
SP-39 24-36"	7.9	0.20	0.17	75	15	10	SL		32.3	0.06	0.5	0.3		14.4	†	†	1.7	1.0	0.20	0.09	1.2	<5	†
SP-40 0-6"	8.0	0.53	0.47	10	42	48	SiC		85.8	0.13	5.7	3.0		14.4	†	†	2.3	4.6	0.86	1.10	1.5	11	†
SP-40 6-12"	8.4	1.81	1.01	5	44	51	SiC		88.4	0.13	2.9	1.5		18.0	†	†	3.1	20	3.6	0.50	1.1	6	†
SP-40 12-22"	9.0	1.29	1.46	21	44	35	CL		76.1	0.15	1.4	0.7		19.9	†	†	0.51	14	4.1	0.26	1.1	6	†
SP-41 0-6"	8.0	0.46	0.12	46	26	28	SCL		51.3	0.12	3.3	1.7		14.5	†	†	3.9	1.7	0.20	1.10	1.4	8	†
SP-41 6-12"	8.0	0.53	0.15	25	34	41	C		54.9	0.14	3.4	1.8		12.1	†	†	4.4	2.7	0.27	1.50	4.7	6	†
SP-41 12-36"	8.1	0.22	0.15	6	44	50	SiC		69.0	0.13	1.7	0.9		16.6	†	†	1.4	1.6	0.19	0.69	1.1	<5	†
SP-41 36-64"	8.2	0.43	0.40	12	52	36	SiCL		63.9	0.16	1.0	0.5		18.5	†	†	1.4	3.9	0.65	0.41	1.1	<5	†
SP-41 64-80"	8.8	0.66	1.63	54	31	15	SL		31.5	0.12	0.6	0.3		17.3	†	†	0.67	5.7	2.9	0.15	1.2	<5	†
SP-42 0-9"	7.9	0.33	0.10	50	30	20	L		42.8	0.12	2.4	1.3		18.0	†	†	3.7	0.97	0.16	0.42	3.9	5	†
SP-42 9-24"	8.1	0.28	0.19	8	49	43	SiC		60.9	0.15	2.6	1.4		18.5	†	†	2.5	1.3	0.26	0.81	3.5	<5	†
SP-42 24-36"	8.3	0.32	0.20	52	27	21	SCL		44.7	0.12	1.7	0.9		16.0	†	†	2.3	2.9	0.31	0.36	1.5	<5	†
SP-42 36-48"	8.6	0.28	1.14	44	34	22	L		31.4	0.13	0.9	0.5		18.2	†	†	0.94	1.8	1.3	0.43	1.4	<5	†
SP-48 0-3"	7.7	0.52	0.92	7	33	60	C	4.8	85.6	0.10	3.5	1.8	0.22	4.5	†	<0.001	3.60	1.30	1.40	0.19	2.60	10	†
SP-48 3-12"	8.0	0.57	4.68	6	30	64	C	5.3	95.4	0.16	1.9	1.0	0.21	7.2	†	<0.001	1.20	0.55	4.40	0.06	1.10	8	†
SP-48 12-30"	8.2	2.63	11.20	12	28	60	C	11.0	106.0	0.10	1.7	0.9	0.23	7.5	†	<0.001	3.00	1.80	17.00	0.13	1.30	7	†
SP-48 30-48"	8.1	4.65	12.70	10	28	62	C	9.5	81.0	0.11	1.6	0.8	0.23	5.2	†	<0.001	6.50	4.10	29.00	0.23	<1.0	7	†
SP-48 48-84"	7.9	6.20	10.80	7	30	63	C	6.5	87.5	0.11	1.5	0.8	0.22	4.0	†	<0.001	15.00	8.10	37.00	0.35	1.40	9	†
SP-49 0-3"	8.1	0.42	0.05	20	49	31	SiCL	4.8	58.0	0.11	2.0	1.1	0.05	17.8	†	†	2.90	1.50	0.07	0.31	<1.0	7	†
SP-49 3-10"	8.4	0.34	0.06	26	47	27	CL-L	5.3	55.5	0.12	2.3	1.2	0.09	17.7	†	†	2.00	1.50	0.08	0.34	<1.0	8	†
SP-50 0-4"	8.4	0.20	0.13	5	37	58	C	11.0	75.4	0.12	1.4	0.7	0.08	18.5	†	†	1.60	0.36	0.13	0.22	1.40	6	†
SP-50 4-11"	8.1	0.27	0.29	<1.0	39	61	C	9.5	66.2	0.12	1.3	0.7	0.14	18.7	†	†	1.90	0.53	0.32	0.24	1.40	8	†
SP-50 11-19"	8.4	0.30	0.52	6	39	55	C	6.5	72.0	0.12	1.4	0.7	0.14	18.5	†	†	1.90	0.59	0.57	0.18	1.30	9	†

1. Usda soil textures: sand (S); loamy sand (LS); sandy loam (SL); loam (L); clay loam (CL); sandy clay loam (SCL); silty clay loam (SiCL); silty clay (SiC); clay (C).
2. **Available water capacity calculated using using *Soil Water Characteristics Model* (Saxton et al., 1986).**
3. Organic carbon calculated from percent organic matter.
4. Erodibility factor (K) calculated from lab and field data

Suitability Rating (Table 4. Utah DOGM, 2005): Good Fair Poor Unacceptable

† Undable to calculate because referenced calcualtion in Table 7, Footnote # 3 above is invalid for soils with percent silt + fine sand greater than 70 percent.

:r·Mou· ·ai· aboratories, Inc.

Soil Analys. .eport
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0610. .1

Date: 11/14/2006
Work Order: S0610051

:t: Talon Resources Soil
Received: 10/3/2006

	Sample ID	Depths	pH	Saturation	Electrical Conductivity	Organic Matter	Calcium	Magnesium	Sodium	Potassium	SAR
		In.	s.u.	%	dS/m	%	meq/L	meq/L	meq/L	meq/L	
051-001	LOF-2	0-7	7.6	43.3	0.47	2.7	4.93	1.26	0.29	0.65	0.16
051-002	LOF-2	7-12	7.7	44.8	0.31	2.4	2.07	0.68	0.22	0.19	0.19
051-003	LOF-2	12-24	7.8	60.2	0.25	1.8	1.29	0.57	0.59	0.09	0.62
051-004	LOF-2	24-48	8.0	67.7	0.32	1.7	0.77	0.53	1.71	0.07	2.12
051-005	LOF-2	48-72	7.8	66.7	7.38	1.1	23.8	24.9	35.8	0.50	7.27
051-006	LOF-2	72-96	7.8	62.9	7.17	1.1	21.6	26.3	37.9	0.47	7.75
051-007	LOF-4	0-5	7.8	52.6	0.62	3.5	4.54	1.04	0.49	0.26	0.29
051-008	LOF-4	5-10	7.7	53.0	0.31	2.8	2.28	0.63	0.32	0.08	0.26
051-009	LOF-4	10-19	7.8	53.9	0.33	2.1	2.00	0.78	0.71	0.08	0.60
051-010	LOF-4	19-31	7.9	53.6	0.29	1.8	1.12	0.52	1.05	0.06	1.16
051-011	LOF-4	31-50	7.8	59.8	4.06	1.1	16.3	12.4	20.5	0.51	5.43
051-012	RDV-7	0-6	7.5	62.9	0.58	4.4	3.93	1.17	0.20	0.28	0.13
051-013	RDV-7	6-12	7.6	57.1	0.36	3.0	2.37	0.78	0.27	0.09	0.22
051-014	RDV-7	12-24	8.0	55.3	0.24	1.8	0.82	0.44	1.04	0.04	1.30
051-015	RDV-7	24-60	8.0	63.8	1.40	1.4	2.65	2.00	7.90	0.11	5.18
051-016	1YR-9	0-6	8.0	63.0	0.62	6.1	2.19	3.21	0.12	0.74	0.07
051-017	1YR-9	6-14	8.2	42.4	0.34	3.4	1.17	1.67	0.25	0.30	0.21
051-018	1YR-9	14-28	8.5	35.7	0.88	0.9	1.16	5.71	1.06	0.72	0.57
051-019	1YR-9	28-48	8.3	31.0	0.76	0.4	1.49	4.64	1.23	0.37	0.70
051-020	1YR-10	0-7	7.8	46.4	0.46	3.9	3.39	0.89	0.08	0.30	0.05

results apply only to the samples tested.

viations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
viations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
llaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter·M[illegible]n Laboratories, Inc.

Soil An[illegible]sis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0[illegible]51001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths	Sand	Silt	Clay	Texture	Very Fine Sand	Boron	Nitrogen Nitrate	Phosphorus	Selenium
		In.	%	%	%		%	ppm	ppm	ppm	ppm
S0610051-001	LOF-2	0-7	32.0	37.0	31.0	Clay Loam	14.9	0.27	1.58	9.55	<0.02
S0610051-002	LOF-2	7-12	34.0	34.0	32.0	Clay Loam	22.3	0.24	0.55	0.40	<0.02
S0610051-003	LOF-2	12-24	14.0	40.0	46.0	Silty Clay	12.4	0.30	0.31	<0.01	<0.02
S0610051-004	LOF-2	24-48	22.0	37.0	41.0	Clay	20.2	0.45	0.88	0.04	<0.02
S0610051-005	LOF-2	48-72	14.0	43.0	43.0	Silty Clay	11.3	1.08	1.07	0.40	0.09
S0610051-006	LOF-2	72-96	18.0	35.0	47.0	Clay	13.0	0.61	13.1	0.76	0.12
S0610051-007	LOF-4	0-5	12.0	46.0	42.0	Silty Clay	9.1		4.16	0.79	
S0610051-008	LOF-4	5-10	14.0	46.0	40.0	Silty Clay	11.0		0.66	9.76	
S0610051-009	LOF-4	10-19	12.0	43.0	45.0	Silty Clay	10.5		0.53	0.64	
S0610051-010	LOF-4	19-31	13.0	43.0	44.0	Silty Clay	11.3		0.40	0.67	
S0610051-011	LOF-4	31-50	19.0	39.0	42.0	Clay	16.3		1.06	0.43	
S0610051-012	RDV-7	0-6	26.0	38.0	36.0	Clay Loam	20.4		2.19	12.5	
S0610051-013	RDV-7	6-12	18.0	38.0	44.0	Clay	11.9		0.28	7.78	
S0610051-014	RDV-7	12-24	16.0	37.0	47.0	Clay	13.6		0.40	0.73	
S0610051-015	RDV-7	24-60	22.0	34.0	44.0	Clay	20.8		0.30	0.46	
S0610051-016	1YR-9	0-6	44.0	32.0	24.0	Loam	14.5		1.73	1.44	
S0610051-017	1YR-9	6-14	52.0	25.0	23.0	Sandy Clay Loam	18.1		0.91	<0.01	
S0610051-018	1YR-9	14-28	64.0	22.0	14.0	Sandy Loam	9.7		0.50	<0.01	
S0610051-019	1YR-9	28-48	54.0	30.0	16.0	Sandy Loam	16.0		0.48	<0.01	
S0610051-020	1YR-10	0-7	36.0	38.0	26.0	Loam	17.9	0.29	3.15	7.45	<0.02

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter-M[illegible]in Laboratories, Inc.

Soil A[illegible]ysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]51001
Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0610051-001	LOF-2	0-7	18.6	3.13
S0610051-002	LOF-2	7-12	20.1	2.19
S0610051-003	LOF-2	12-24	26.7	2.19
S0610051-004	LOF-2	24-48	26.9	1.88
S0610051-005	LOF-2	48-72	27.5	1.25
S0610051-006	LOF-2	72-96	21.0	0.94
S0610051-007	LOF-4	0-5	22.5	3.03
S0610051-008	LOF-4	5-10	24.4	2.72
S0610051-009	LOF-4	10-19	25.3	2.40
S0610051-010	LOF-4	19-31	25.3	1.88
S0610051-011	LOF-4	31-50	27.6	1.46
S0610051-012	RDV-7	0-6	10.6	3.76
S0610051-013	RDV-7	6-12	13.2	2.82
S0610051-014	RDV-7	12-24	21.2	2.09
S0610051-015	RDV-7	24-60	23.4	1.78
S0610051-016	1YR-9	0-6	18.6	4.49
S0610051-017	1YR-9	6-14	15.3	2.30
S0610051-018	1YR-9	14-28	21.2	3.03
S0610051-019	1YR-9	28-48	26.4	2.40
S0610051-020	1YR-10	0-7	19.2	4.18

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter-M[redacted]in Laboratories, Inc.

Soil [redacted]ysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[redacted]51001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths	pH	Saturation	Electrical Conductivity	Organic Matter	Calcium	Magnesium	Sodium	Potassium	SAR
		In.	s.u.	%	dS/m	%	meq/L	meq/L	meq/L	meq/L	
S0610051-021	1YR-10	7-13	7.7	44.4	0.40	2.4	2.58	0.80	0.08	0.24	0.06
S0610051-022	1YR-10	13-26	7.9	41.7	0.34	1.6	2.00	0.95	0.09	0.21	0.07
S0610051-023	1YR-10	26-44	8.3	45.4	0.36	1.0	0.83	2.50	0.20	0.08	0.16
S0610051-024	1YR-10	44-68	8.5	46.0	0.34	0.5	0.71	2.07	0.58	0.05	0.49
S0610051-025	1YR-10	68-84	8.4	28.0	0.46	0.2	0.77	2.96	0.66	0.05	0.48
S0610051-026	1YR-12	0-5	7.8	46.8	0.38	2.3	2.66	0.91	0.17	0.20	0.13
S0610051-027	1YR-12	5-10	7.8	50.6	0.29	1.9	1.79	0.69	0.66	0.08	0.59
S0610051-028	1YR-12	10-26	8.4	58.6	0.21	0.7	0.50	0.24	1.34	0.04	2.20
S0610051-029	1YR-12	26-44	8.3	93.0	0.86	0.7	0.91	0.57	5.89	0.08	6.84
S0610051-030	SP-14	0-6	8.7	58.6	0.54	4.0	2.34	2.42	0.22	0.35	0.14
S0610051-031	SP-14	6-13	7.8	62.4	0.36	2.1	1.08	2.05	0.27	0.17	0.22
S0610051-032	SP-14	13-28	8.1	50.7	0.53	0.7	0.41	3.76	0.70	0.14	0.49
S0610051-033	SP-14	28-48	8.7	43.7	0.77	0.4	0.49	5.04	2.24	0.10	1.35
S0610051-034	SP-14	48-70	8.8	41.7	0.80	0.4	0.54	4.79	2.61	0.11	1.60
S0610051-045	SP-14	70-90	8.5	55.0	0.89	0.6	0.74	3.87	1.94	0.11	1.28
S0610051-036	DAH-24	0-5	7.6	73.6	0.26	1.3	1.25	0.58	0.50	0.09	0.53
S0610051-037	DAH-24	5-17	7.7	84.1	0.43	1.2	1.62	0.65	1.40	0.09	1.32
S0610051-038	DAH-24	17-32	8.1	91.2	7.79	0.9	18.7	30.7	49.9	0.54	10.0
S0610051-040	DAH-25	0-5	6.4	58.5	0.21	3.3	0.98	0.62	0.49	0.08	0.55
S0610051-041	DAH-25	5-13	7.0	80.6	0.33	2.4	1.90	0.68	0.23	0.13	0.21

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

nter·M Laboratories, Inc.

Soil Analy... Report

Talon Resources, Inc.

PO Box 1230

Huntington, UT 84528

Report ID: S0610_ .001

Date: 11/14/2006

Work Order: S0610051

ɔject: Talon Resources Soil

ate Received: 10/3/2006

ɪb ID	Sample ID	Depths	Sand	Silt	Clay	Texture	Very Fine Sand	Boron	Nitrogen Nitrate	Phosphorus	Selenium
		In.	%	%	%		%	ppm	ppm	ppm	ppm
)610051-021	1YR-10	7-13	26.0	48.0	26.0	Loam	12.3	0.31	0.46	0.67	<0.02
)610051-022	1YR-10	13-26	14.0	52.0	34.0	Silty Clay Loam	9.4	0.20	0.44	0.37	<0.02
)610051-023	1YR-10	26-44	30.0	36.0	34.0	Clay Loam	29.1	0.37	0.15	<0.01	<0.02
)610051-024	1YR-10	44-68	14.0	54.0	32.0	Silty Clay Loam	7.0	0.24	0.19	<0.01	<0.02
)610051-025	1YR-10	68-84	60.0	30.0	10.0	Sandy Loam	24.5	0.07	0.32	0.67	<0.02
)610051-026	1YR-12	0-5	32.0	40.0	28.0	Clay Loam	28.9		0.87	7.33	
)610051-027	1YR-12	5-10	29.0	39.0	32.0	Clay Loam	22.2		0.67	0.22	
)610051-028	1YR-12	10-26	16.0	40.0	44.0	Silty Clay	13.8		0.94	<0.01	
)610051-029	1YR-12	26-44	46.0	19.0	35.0	Sandy Clay	45.0		0.20	<0.01	
)610051-030	SP-14	0-6	8.0	48.0	44.0	Silty Clay	5.3		0.38	8.92	
)610051-031	SP-14	6-13	8.0	48.0	44.0	Silty Clay	5.7		0.58	2.94	
)610051-032	SP-14	13-28	23.0	50.0	27.0	Clay Loam	21.4		0.17	4.40	
)610051-033	SP-14	28-48	40.0	43.0	17.0	Loam	33.6		0.21	2.67	
)610051-034	SP-14	48-70	21.0	40.0	39.0	Clay Loam	5.6		0.41	3.54	
)610051-045	SP-14	70-90	21.0	47.0	32.0	Clay Loam	17.7		0.64	0.31	
)610051-036	DAH-24	0-5	34.0	19.0	47.0	Clay	33.0	0.23	4.14	2.25	<0.02
)610051-037	DAH-24	5-17	42.0	14.0	44.0	Clay	41.4	0.42	0.19	0.16	<0.02
)610051-038	DAH-24	17-32	38.0	17.0	45.0	Clay	36.5	0.73	0.09	<0.01	<0.02
)610051-040	DAH-25	0-5	32.0	28.0	40.0	Clay	21.1		3.85	6.80	
)610051-041	DAH-25	5-13	30.0	23.0	47.0	Clay	21.6		0.20	0.19	

ɪese results apply only to the samples tested.

ɔbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

ɔbbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

iscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ɹeviewed by: Karen ABarten

Karen Barten, Soil Lab Supervisor

Inter·M[illegible]n Laboratories, Inc.

Soil A[illegible]s Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0[illegible]1001

Date: 11/14/2006
Work Order: S0610051

roject: Talon Resources Soil
ate Received: 10/3/2006

ab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
0610051-021	1YR-10	7-13	13.9	3.13
0610051-022	1YR-10	13-26	27.8	3.03
0610051-023	1YR-10	26-44	35.5	3.55
0610051-024	1YR-10	44-68	34.4	2.51
0610051-025	1YR-10	68-84	26.4	2.93
0610051-026	1YR-12	0-5	0.1	3.03
0610051-027	1YR-12	5-10	9.3	2.51
0610051-028	1YR-12	10-26	18.8	1.99
0610051-029	1YR-12	26-44	11.9	1.67
0610051-030	SP-14	0-6	7.5	4.81
0610051-031	SP-14	6-13	19.9	2.61
0610051-032	SP-14	13-28	44.0	4.28
0610051-033	SP-14	28-48	39.3	3.55
0610051-034	SP-14	48-70	30.9	5.12
0610051-045	SP-14	70-90	31.5	2.61
0610051-036	DAH-24	0-5	2.9	1.57
0610051-037	DAH-24	5-17	8.7	1.88
0610051-038	DAH-24	17-32	5.0	1.88
0610051-040	DAH-25	0-5	1.7	0.52
0610051-041	DAH-25	5-13	30.3	1.36

hese results apply only to the samples tested.

bbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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liscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter·M[illegible] Laboratories, Inc.

Soil A[illegible]sis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0[illegible]1001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths	pH	Saturation	Electrical Conductivity	Organic Matter	Calcium	Magnesium	Sodium	Potassium	SAR
		In.	s.u.	%	dS/m	%	meq/L	meq/L	meq/L	meq/L	
0610051-042	DAH-25	13-20	7.2	73.5	0.28	2.1	1.44	0.44	0.22	0.12	0.23
0610051-043	DAH-25	20-32	7.7	54.1	0.26	1.2	1.34	0.52	0.25	0.09	0.25
0610051-046	SP-15	0-8	8.0	46.5	0.54	3.5	2.01	2.43	0.12	0.41	0.08
0610051-047	SP-15	8-20	8.5	35.2	0.50	0.8	0.70	3.80	0.17	0.31	0.11
0610051-048	SP-15	20-37	8.7	30.7	0.78	0.5	0.64	5.91	1.30	0.21	0.72
0610051-049	SP-15	37-58	8.6	36.9	1.56	0.4	0.90	12.0	4.60	0.18	1.81
0610051-050	SP-15	58-73	8.4	27.2	3.35	0.1	2.52	33.5	8.14	0.26	1.92
0610051-051	SP-15	73-96	8.3	30.2	1.77	0.3	1.70	12.4	3.30	0.19	1.24
0610051-052	WRD-17	0-9	7.8	49.8	0.43	4.6	1.74	1.11	0.14	0.51	0.11
0610051-053	WRD-17	9-18	8.0	39.6	0.24	2.0	1.14	0.63	0.16	0.23	0.17
0610051-054	WRD-17	18-30	8.0	38.5	0.32	1.6	0.99	0.69	0.10	0.15	0.11
0610051-055	WRD-17	30-45	8.1	39.3	0.28	0.8	0.59	0.56	0.10	0.05	0.13
0610051-056	WRD-17	45-60	8.2	40.0	0.34	0.8	1.17	1.64	0.26	0.07	0.22
0610051-057	WRD-17	60-80	8.0	61.3	0.82	1.1	2.86	4.00	0.69	0.14	0.37
0610051-058	WRD-18A	0-7	7.7	46.0	0.61	3.9	3.08	1.36	0.15	0.59	0.10
0610051-059	WRD-18A	7-15	8.0	43.4	0.33	2.1	1.45	1.00	0.13	0.28	0.12
0610051-060	WRD-18A	15-30	8.1	31.1	0.51	0.7	1.97	2.13	0.41	0.09	0.29
0610051-061	WRD-18A	30-45	8.0	52.4	0.67	1.5	2.66	3.06	0.51	0.12	0.30
0610051-062	WRD-18A	45-60	7.9	36.1	0.44	0.7	1.67	1.63	0.47	0.06	0.36
0610051-063	WRD-20	0-6	7.9	53.3	0.57	6.6	2.75	1.83	0.12	0.58	0.08

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Soil Ana[illegible]sis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S06[illegible]51001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0610051-042	DAH-25	13-20	30.0	24.0	46.0	Clay	20.7		0.29	1.32	
S0610051-043	DAH-25	20-32	48.0	19.0	33.0	Sandy Clay Loam	37.6		0.15	0.43	
S0610051-046	SP-15	0-8	52.0	32.0	16.0	Sandy Loam	24.2		0.68	4.82	
S0610051-047	SP-15	8-20	50.0	32.0	18.0	Loam	24.3		0.16	1.80	
S0610051-048	SP-15	20-37	51.0	34.0	15.0	Loam	23.7		0.58	1.56	
S0610051-049	SP-15	37-58	39.0	43.0	18.0	Loam	22.7		0.32	1.20	
S0610051-050	SP-15	58-73	74.0	18.0	8.0	Sandy Loam	19.2		0.36	0.82	
S0610051-051	SP-15	73-96	52.0	34.0	14.0	Sandy Loam	25.3		0.54	<0.01	
S0610051-052	WRD-17	0-9	22.0	42.0	36.0	Clay Loam	11.0		1.09	8.05	
S0610051-053	WRD-17	9-18	34.0	34.0	32.0	Clay Loam	16.6		0.28	1.26	
S0610051-054	WRD-17	18-30	44.0	34.0	22.0	Loam	17.3		0.85	2.49	
S0610051-055	WRD-17	30-45	36.0	37.0	27.0	Clay Loam	17.5		0.10	2.82	
S0610051-056	WRD-17	45-60	24.0	44.0	32.0	Clay Loam	14.8		0.11	0.13	
S0610051-057	WRD-17	60-80	18.0	40.0	42.0	Silty Clay	17.0		0.59	0.70	
S0610051-058	WRD-18A	0-7	41.0	33.0	26.0	Loam	18.3		0.57	1.95	
S0610051-059	WRD-18A	7-15	43.0	33.0	24.0	Loam	20.0		0.68	0.61	
S0610051-060	WRD-18A	15-30	60.0	23.0	17.0	Sandy Loam	17.6		0.08	2.43	
S0610051-061	WRD-18A	30-45	24.0	41.0	35.0	Clay Loam	13.8		0.13	0.34	
S0610051-062	WRD-18A	45-60	57.0	23.0	20.0	Sandy Clay Loam	18.4		0.16	<0.01	
S0610051-063	WRD-20	0-6	39.0	37.0	24.0	Loam	15.4		0.19	0.94	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S06[illegible]51001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0610051-042	DAH-25	13-20	39.4	1.88
S0610051-043	DAH-25	20-32	3.8	1.88
S0610051-046	SP-15	0-8	10.8	4.70
S0610051-047	SP-15	8-20	27.6	4.60
S0610051-048	SP-15	20-37	31.9	4.08
S0610051-049	SP-15	37-58	33.4	3.03
S0610051-050	SP-15	58-73	26.3	1.99
S0610051-051	SP-15	73-96	28.1	2.82
S0610051-052	WRD-17	0-9	25.4	3.34
S0610051-053	WRD-17	9-18	25.3	1.78
S0610051-054	WRD-17	18-30	25.3	2.61
S0610051-055	WRD-17	30-45	29.5	2.40
S0610051-056	WRD-17	45-60	33.5	2.19
S0610051-057	WRD-17	60-80	33.0	1.88
S0610051-058	WRD-18A	0-7	20.2	3.97
S0610051-059	WRD-18A	7-15	24.7	2.30
S0610051-060	WRD-18A	15-30	28.2	2.30
S0610051-061	WRD-18A	30-45	29.3	1.88
S0610051-062	WRD-18A	45-60	25.8	2.09
S0610051-063	WRD-20	0-6	18.4	4.49

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter-M[illegible]n Laboratories, Inc.

Soil A[illegible]ysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]2001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths	pH	Saturation	Electrical Conductivity	Organic Matter	Calcium	Magnesium	Sodium	Potassium	SAR
		In.	s.u.	%	dS/m	%	meq/L	meq/L	meq/L	meq/L	
S0609512-001	LOF-1	0-6	7.3	50.2	1.56	3.6	9.03	2.09	0.55	2.20	0.23
S0609512-002	LOF-1	6-12	8.3	54.4	0.52	1.8	2.63	1.09	1.57	0.18	1.15
S0609512-003	LOF-1	12-24	8.5	54.8	0.42	1.6	1.07	0.59	2.65	0.07	2.91
S0609512-004	LOF-1	24-42	8.7	60.8	0.90	1.5	1.61	0.87	4.47	0.14	4.02
S0609512-005	LOF-1	42-60	8.4	65.4	4.75	1.1	6.45	7.65	32.7	0.45	12.3
S0609512-006	LOF-3	0-4	8.1	47.7	0.82	3.9	5.98	1.58	0.53	1.02	0.27
S0609512-007	LOF-3	4-11	8.3	51.8	0.43	2.9	3.19	0.73	0.36	0.27	0.25
S0609512-008	LOF-3	11-19	8.1	42.7	0.41	2.3	2.86	0.88	0.44	0.22	0.32
S0609512-009	LOF-3	19-33	8.4	53.5	0.71	2.2	1.67	0.89	4.58	0.15	4.05
S0609512-011	RDV-5	0-5	8.1	42.7	0.54	3.6	3.72	0.90	0.41	0.36	0.27
S0609512-012	RDV-5	5-10	8.1	39.3	0.50	3.0	3.98	0.95	0.30	0.23	0.19
S0609512-013	RDV-5	10-25	8.4	32.3	0.37	1.1	2.37	0.89	0.40	0.22	0.31
S0609512-014	RDV-5	25-48	8.8	56.0	0.72	1.7	0.84	0.60	6.33	0.11	7.45
S0609512-015	RDV-5	48-60	9.0	83.6	3.37	1.3	1.26	1.76	29.5	0.20	24.0
S0609512-016	RDV-6	0-6	8.1	27.9	0.52	1.1	2.99	1.06	0.48	0.77	0.34
S0609512-017	RDV-6	6-12	8.3	29.9	0.31	0.7	2.13	0.47	0.28	0.14	0.25
S0609512-018	RDV-6	12-24	8.0	35.4	0.64	2.6	4.52	1.68	0.36	0.33	0.20
S0609512-019	RDV-6	24-34	8.3	29.7	0.40	0.7	2.43	1.35	0.41	0.18	0.30
S0609512-020	RDV-6	34-60	8.5	52.9	0.83	1.8	1.83	2.24	4.89	0.19	3.43
S0609512-021	1YR-8	0-8	8.0	51.5	0.68	5.8	3.68	2.81	0.33	0.45	0.18

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

nter·M[redacted] Laboratories, Inc.

Soil Analy[redacted] Report

Talon Resources, Inc.

PO Box 1230

Huntington, UT 84528

Report ID: S060[redacted]01

Date: 11/13/2006

Work Order: S0609512

:oject: Talon Resources Soil

ate Received: 9/28/2006

ab ID	Sample ID	Depths	Sand	Silt	Clay	Texture	Very Fine Sand	Boron	Nitrogen Nitrate	Phosphorus	Selenium
		In.	%	%	%		%	ppm	ppm	ppm	ppm
)609512-001	LOF-1	0-6	25.0	39.0	36.0	Clay Loam	20.1		1.99	2.86	
)609512-002	LOF-1	6-12	26.0	38.0	36.0	Clay Loam	24.3		<0.02	0.18	
)609512-003	LOF-1	12-24	18.0	40.0	42.0	Silty Clay	16.5		0.23	0.93	
)609512-004	LOF-1	24-42	13.0	41.0	46.0	Silty Clay	11.3		0.34	<0.01	
0609512-005	LOF-1	42-60	19.0	39.0	42.0	Clay	17.1		0.21	0.07	
0609512-006	LOF-3	0-4	32.0	42.0	26.0	Loam	17.5		10.6	<0.01	
0609512-007	LOF-3	4-11	24.0	48.0	28.0	Clay Loam	15.9		1.07	0.90	
0609512-008	LOF-3	11-19	16.0	50.0	34.0	Silty Clay Loam	14.0		0.43	0.56	
0609512-009	LOF-3	19-33	17.0	43.0	40.0	Silty Clay	16.1		0.32	0.07	
0609512-011	RDV-5	0-5	38.0	44.0	18.0	Loam	22.6		6.14	10.4	
0609512-012	RDV-5	5-10	33.0	47.0	20.0	Loam	18.9		<0.02	1.82	
0609512-013	RDV-5	10-25	54.0	32.0	14.0	Sandy Loam	19.0		0.22	16.4	
0609512-014	RDV-5	25-48	16.0	72.0	12.0	Silt Loam	13.4		0.16	1.48	
0609512-015	RDV-5	48-60	31.0	47.0	22.0	Loam	26.6		0.22	1.62	
0609512-016	RDV-6	0-6	82.0	12.0	6.0	Loamy Sand	21.0		1.68	9.41	
0609512-017	RDV-6	6-12	80.0	14.0	6.0	Loamy Sand	18.5		0.24	0.67	
0609512-018	RDV-6	12-24	45.0	37.0	18.0	Loam	17.8		<0.02	0.56	
0609512-019	RDV-6	24-34	69.0	23.0	8.0	Sandy Loam	35.5		0.07	0.56	
0609512-020	RDV-6	34-60	19.0	41.0	40.0	Silty Clay	15.5		0.03	<0.01	
0609512-021	1YR-8	0-8	36.0	34.0	30.0	Clay Loam	19.7		3.82	10.9	

'hese results apply only to the samples tested.

ıbbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

ıbbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

/liscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

nter·Mo Laboratories, Inc.

Soil Ana Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S06 .001

Date: 11/13/2006
Work Order: S0609512

roject: Talon Resources Soil
ate Received: 9/28/2006

ab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
0609512-001	LOF-1	0-6	22.6	3.76
0609512-002	LOF-1	6-12	27.1	3.45
0609512-003	LOF-1	12-24	26.6	2.72
0609512-004	LOF-1	24-42	27.1	4.08
0609512-005	LOF-1	42-60	28.3	1.67
0609512-006	LOF-3	0-4	20.3	5.64
0609512-007	LOF-3	4-11	20.4	3.55
0609512-008	LOF-3	11-19	24.2	2.51
0609512-009	LOF-3	19-33	27.2	3.87
0609512-011	RDV-5	0-5	25.7	3.97
0609512-012	RDV-5	5-10	26.4	4.08
0609512-013	RDV-5	10-25	31.1	2.72
0609512-014	RDV-5	25-48	28.0	4.91
0609512-015	RDV-5	48-60	26.5	6.06
0609512-016	RDV-6	0-6	18.4	3.97
0609512-017	RDV-6	6-12	20.6	2.51
0609512-018	RDV-6	12-24	28.9	4.18
0609512-019	RDV-6	24-34	29.2	2.93
0609512-020	RDV-6	34-60	25.9	5.96
0609512-021	1YR-8	0-8	5.1	5.54

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter·M[redacted]in Laboratories, Inc.

Soil A[redacted]s Report

Talon Resources, Inc.

PO Box 1230

Huntington, UT 84528

Report ID: SC[redacted]2001

Date: 11/13/2006

Work Order: S0609512

Project: Talon Resources Soil

Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Sodium meq/L	Potassium meq/L	SAR
S0609512-022	1YR-8	8-14	8.1	43.1	0.53	2.1	3.22	1.63	0.29	0.34	0.18
S0609512-023	1YR-8	14-22	8.5	35.8	0.40	1.1	1.77	1.31	0.53	0.37	0.43
S0609512-024	1YR-8	22-45	8.9	37.6	0.44	0.7	0.71	3.05	0.39	0.45	0.28
S0609512-025	1YR-8	45-65	9.0	27.4	0.49	0.4	0.70	3.46	0.40	0.41	0.28
S0609512-026	1YR-8	65-85	8.9	25.9	0.56	0.3	1.24	3.81	1.03	0.19	0.65
S0609512-027	1YR-9A	0-12	9.0	47.0	0.91	4.7	0.98	7.93	0.62	0.65	0.30
S0609512-028	1YR-9A	12-24	9.1	32.8	0.83	1.4	0.44	7.78	0.46	0.71	0.23
S0609512-029	1YR-9A	24-42	9.6	26.4	1.26	0.3	0.76	6.48	7.06	0.34	3.71
S0609512-030	1YR-9A	42-70	9.4	27.7	0.90	0.3	0.63	3.77	4.73	0.16	3.19
S0609512-031	1YR-9A	70-100	8.5	68.6	1.31	0.5	1.72	8.32	3.31	0.19	1.48
S0609512-032	1YR-11	0-5	8.0	36.3	0.48	2.4	2.44	1.84	0.28	0.39	0.19
S0609512-033	1YR-11	5-16	8.2	31.3	0.50	1.7	2.76	1.42	0.40	0.36	0.28
S0609512-034	1YR-11	16-32	8.3	27.9	0.38	0.9	1.89	0.87	0.26	0.37	0.22
S0609512-035	1YR-11	32-48	8.3	27.3	0.41	0.5	1.90	1.06	0.32	0.29	0.26
S0609512-036	1YR-11	48-72	8.6	28.1	0.33	0.3	1.44	0.96	0.27	0.12	0.24
S0609512-037	1YR-11	72-90	8.7	23.9	0.29	0.2	1.37	1.15	0.39	0.13	0.35
S0609512-038	SP-13	0-6	8.5	34.1	0.72	2.7	4.77	2.10	0.31	0.90	0.17
S0609512-039	SP-13	6-12	8.2	43.3	0.52	1.7	2.64	1.72	0.33	0.41	0.22
S0609512-040	SP-13	12-24	8.4	62.3	0.55	2.9	1.67	3.09	0.35	0.26	0.23
S0609512-041	SP-13	24-48	8.5	46.3	0.47	1.2	0.91	3.26	0.42	0.12	0.29

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0609512-022	1YR-8	8-14	38.0	32.0	30.0	Clay Loam	17.2		0.05	0.07	
S0609512-023	1YR-8	14-22	48.0	30.0	22.0	Loam	19.5		0.17	0.21	
S0609512-024	1YR-8	22-45	42.0	42.0	16.0	Loam	23.9		0.50	2.51	
S0609512-025	1YR-8	45-65	79.0	13.0	8.0	Loamy Sand	19.8		0.27	0.18	
S0609512-026	1YR-8	65-85	80.0	12.0	8.0	Loamy Sand	17.9		0.20	0.10	
S0609512-027	1YR-9A	0-12	60.0	32.0	8.0	Sandy Loam	26.6		4.23	10.0	
S0609512-028	1YR-9A	12-24	68.0	22.0	10.0	Sandy Loam	22.2		0.21	2.02	
S0609512-029	1YR-9A	24-42	68.0	22.0	10.0	Sandy Loam	20.4		0.13	2.22	
S0609512-030	1YR-9A	42-70	69.0	21.0	10.0	Sandy Loam	26.7		0.26	1.88	
S0609512-031	1YR-9A	70-100	30.0	31.0	39.0	Clay Loam	27.3		0.29	0.82	
S0609512-032	1YR-11	0-5	72.0	19.0	9.0	Sandy Loam	19.9		1.58	8.21	
S0609512-033	1YR-11	5-16	69.0	17.0	14.0	Sandy Loam	20.0		0.13	0.82	
S0609512-034	1YR-11	16-32	72.0	18.0	10.0	Sandy Loam	16.1		0.20	1.53	
S0609512-035	1YR-11	32-48	79.0	13.0	8.0	Loamy Sand	17.1		0.23	0.44	
S0609512-036	1YR-11	48-72	78.0	14.0	8.0	Loamy Sand	18.4		0.12	2.20	
S0609512-037	1YR-11	72-90	89.0	7.0	4.0	Sand	14.1		0.10	4.93	
S0609512-038	SP-13	0-6	59.0	23.0	18.0	Sandy Loam	15.8		3.78	39.5	
S0609512-039	SP-13	6-12	23.0	51.0	26.0	Silt Loam	12.7		0.18	3.83	
S0609512-040	SP-13	12-24	14.0	44.0	42.0	Silty Clay	9.1		0.50	0.70	
S0609512-041	SP-13	24-48	22.0	46.0	32.0	Clay Loam	9.5		0.46	0.44	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter-M[redacted]ain Laboratories, Inc.

Soil A[redacted]ysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[redacted]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0609512-022	1YR-8	8-14	16.3	2.93
S0609512-023	1YR-8	14-22	27.3	2.30
S0609512-024	1YR-8	22-45	30.8	3.55
S0609512-025	1YR-8	45-65	19.3	3.66
S0609512-026	1YR-8	65-85	20.4	4.18
S0609512-027	1YR-9A	0-12	26.1	6.90
S0609512-028	1YR-9A	12-24	22.0	7.94
S0609512-029	1YR-9A	24-42	23.6	10.6
S0609512-030	1YR-9A	42-70	23.5	5.22
S0609512-031	1YR-9A	70-100	9.8	2.82
S0609512-032	1YR-11	0-5	1.4	3.76
S0609512-033	1YR-11	5-16	4.2	3.55
S0609512-034	1YR-11	16-32	14.4	3.13
S0609512-035	1YR-11	32-48	19.6	2.93
S0609512-036	1YR-11	48-72	21.7	2.82
S0609512-037	1YR-11	72-90	18.2	2.19
S0609512-038	SP-13	0-6	19.7	5.64
S0609512-039	SP-13	6-12	27.9	3.87
S0609512-040	SP-13	12-24	26.9	3.87
S0609512-041	SP-13	24-48	32.2	3.55

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter·Mo[illegible]in Laboratories, Inc.

Soil A[illegible]is Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]2001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths	pH	Saturation	Electrical Conductivity	Organic Matter	Calcium	Magnesium	Sodium	Potassium	SAR
		In.	s.u.	%	dS/m	%	meq/L	meq/L	meq/L	meq/L	
S0609512-042	SP-13	48-60	8.8	46.1	0.31	1.8	0.53	3.00	0.67	0.10	0.51
S0609512-043	SP-13	60-72	8.9	35.6	1.46	1.2	1.64	8.30	4.90	0.14	2.20
S0609512-044	SP-13	72-84	8.7	33.5	2.20	0.5	2.07	15.5	7.00	0.20	2.36
S0609512-045	SP-16	0-8	8.3	64.5	0.58	4.8	3.08	1.84	0.49	0.42	0.31
S0609512-046	SP-16	8-18	8.2	61.9	0.60	1.9	2.00	2.77	0.39	0.28	0.25
S0609512-047	SP-16	18-36	8.7	50.6	0.45	0.6	0.68	3.12	0.53	0.19	0.38
S0609512-048	SP-16	36-56	9.0	52.2	0.34	0.6	0.45	3.38	0.77	0.14	0.56
S0609512-049	SP-16	56-68	8.9	36.3	0.60	0.3	0.52	4.30	1.21	0.16	0.78
S0609512-050	SP-16	68-96	8.9	55.3	0.53	0.6	1.00	3.49	1.21	0.18	0.81
S0609512-051	WRD-18	0-9	8.2	43.4	0.35	3.6	4.56	1.75	0.31	0.65	0.18
S0609512-052	WRD-18	9-19	8.3	41.3	0.61	1.8	3.45	1.56	0.27	0.80	0.17
S0609512-053	WRD-18	19-34	8.5	35.8	0.52	1.2	2.41	2.17	0.31	0.18	0.21
S0609512-054	WRD-18	34-54	8.7	45.5	0.38	1.4	1.63	1.70	0.35	0.12	0.27
S0609512-055	WRD-18	54-72	8.6	49.6	0.57	1.1	1.92	2.53	0.46	0.18	0.31
S0609512-056	WRD-18	72-96	8.6	34.7	1.46	0.5	2.97	11.0	1.48	0.19	0.56
S0609512-057	WRD-19	0-6	8.0	48.5	0.91	4.9	4.87	2.07	0.28	1.72	0.15
S0609512-058	WRD-19	6-12	8.2	44.1	0.65	3.0	3.43	1.45	0.30	1.14	0.20
S0609512-059	WRD-19	12-24	8.3	40.8	0.53	2.0	2.85	1.21	0.32	0.87	0.23
S0609512-060	WRD-19	24-37	8.5	40.8	0.55	1.9	2.71	1.11	0.26	0.76	0.19
S0609512-061	WRD-19	37-51	8.4	34.1	0.57	1.2	2.94	1.39	0.27	0.59	0.18

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter-M[redacted]n Laboratories, Inc.

Soil An[redacted]s Report

Talon Resources, Inc.

PO Box 1230

Huntington, UT 84528

Report ID: S0[redacted]001

Date: 11/13/2006

Work Order: S0609512

roject: Talon Resources Soil

ate Received: 9/28/2006

ab ID	Sample ID	Depths	Sand	Silt	Clay	Texture	Very Fine Sand	Boron	Nitrogen Nitrate	Phosphorus	Selenium
		In.	%	%	%		%	ppm	ppm	ppm	ppm
0609512-042	SP-13	48-60	33.0	39.0	28.0	Clay Loam	13.4		0.17	<0.01	
0609512-043	SP-13	60-72	62.0	14.0	24.0	Sandy Clay Loam	19.2		0.23	0.99	
0609512-044	SP-13	72-84	44.0	36.0	20.0	Loam	18.5		0.29	0.73	
0609512-045	SP-16	0-8	19.0	45.0	36.0	Silty Clay Loam	15.1		1.19	18.3	
0609512-046	SP-16	8-18	12.0	44.0	44.0	Silty Clay	10.8		0.21	4.70	
0609512-047	SP-16	18-36	20.0	52.0	28.0	Clay Loam	16.2		0.24	6.45	
0609512-048	SP-16	36-56	14.0	58.0	28.0	Silty Clay Loam	12.4		0.23	5.10	
0609512-049	SP-16	56-68	50.0	36.0	14.0	Loam	21.6		0.30	2.83	
0609512-050	SP-16	68-96	23.0	49.0	28.0	Clay Loam	17.0		0.24	1.25	
0609512-051	WRD-18	0-9	34.0	40.0	26.0	Loam	11.4	0.39	3.96	18.6	<0.02
0609512-052	WRD-18	9-19	50.0	30.0	20.0	Loam	16.2	0.25	0.31	2.89	<0.02
0609512-053	WRD-18	19-34	44.0	38.0	18.0	Loam	21.0	0.18	0.09	5.50	<0.02
0609512-054	WRD-18	34-54	21.0	47.0	32.0	Clay Loam	13.4	0.33	0.50	0.93	<0.02
0609512-055	WRD-18	54-72	22.0	44.0	34.0	Clay Loam	11.8	0.29	0.10	1.19	<0.02
0609512-056	WRD-18	72-96	48.0	32.0	20.0	Loam	21.2	0.19	0.45	0.21	<0.02
0609512-057	WRD-19	0-6	34.0	42.0	24.0	Loam	16.5		2.77	12.9	
0609512-058	WRD-19	6-12	32.0	36.0	32.0	Clay Loam	13.1		1.85	8.32	
0609512-059	WRD-19	12-24	34.0	36.0	30.0	Clay Loam	15.8		0.67	1.99	
0609512-060	WRD-19	24-37	49.0	29.0	22.0	Loam	24.5		0.35	0.99	
0609512-061	WRD-19	37-51	60.0	26.0	14.0	Sandy Loam	24.2			1.53	

hese results apply only to the samples tested.

bbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

bbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

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Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter·M[redacted]n Laboratories, Inc.

[redacted]

Soil An[redacted]is Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0 [redacted] .2001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0609512-042	SP-13	48-60	29.2	1.67
S0609512-043	SP-13	60-72	20.6	7.00
S0609512-044	SP-13	72-84	28.7	3.03
S0609512-045	SP-16	0-8	9.6	4.81
S0609512-046	SP-16	8-18	24.5	3.55
S0609512-047	SP-16	18-36	38.8	4.18
S0609512-048	SP-16	36-56	40.1	3.66
S0609512-049	SP-16	56-68	28.1	4.08
S0609512-050	SP-16	68-96	31.0	4.81
S0609512-051	WRD-18	0-9	23.8	5.54
S0609512-052	WRD-18	9-19	20.3	4.60
S0609512-053	WRD-18	19-34	27.5	3.13
S0609512-054	WRD-18	34-54	29.0	2.61
S0609512-055	WRD-18	54-72	28.3	3.76
S0609512-056	WRD-18	72-96	23.1	8.99
S0609512-057	WRD-19	0-6	20.1	6.69
S0609512-058	WRD-19	6-12	17.4	4.39
S0609512-059	WRD-19	12-24	23.5	2.51
S0609512-060	WRD-19	24-37	24.6	3.13
S0609512-061	WRD-19	37-51	22.7	2.40

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter-M[illegible]ain Laboratories, Inc.

Soil A[illegible]ysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: SL[illegible]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths	pH	Saturation	Electrical Conductivity	Organic Matter	Calcium	Magnesium	Sodium	Potassium	SAR
		In.	s.u.	%	dS/m	%	meq/L	meq/L	meq/L	meq/L	
S0609512-062	WRD-19	51-68	8.5	29.1	0.48	0.8	2.07	1.87	0.36	0.22	0.26
S0609512-063	WRD-19	68-90	8.7	26.0	0.37	0.6	1.11	2.06	0.37	0.10	0.30
S0609512-064	WRD-21	0-8	8.4	30.6	0.46	2.0	2.94	0.74	0.26	0.48	0.19
S0609512-065	WRD-21	8-18	8.1	46.0	0.66	3.2	4.12	1.78	0.29	0.20	0.17
S0609512-066	WRD-21	18-36	8.4	30.5	0.49	1.2	2.64	1.61	0.33	0.10	0.22
S0609512-067	WRD-21	36-50	8.7	28.6	0.48	0.9	2.71	1.62	0.36	0.15	0.24
S0609512-068	WRD-21	50-62	8.7	27.9	0.37	1.0	1.91	1.24	0.32	0.12	0.25
S0609512-069	WRD-21	62-96	8.7	26.7	0.32	0.7	1.34	1.60	0.30	0.09	0.25

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Soil A[illegible]sis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths	Sand	Silt	Clay	Texture	Very Fine Sand	Boron	Nitrogen Nitrate	Phosphorus	Selenium
		In.	%	%	%		%	ppm	ppm	ppm	ppm
S0609512-062	WRD-19	51-68	66.0	22.0	12.0	Sandy Loam	17.5		0.41	1.71	
S0609512-063	WRD-19	68-90	71.0	19.0	10.0	Sandy Loam	17.6		0.18	1.88	
S0609512-064	WRD-21	0-8	61.0	11.0	28.0	Sandy Clay Loam	18.6		2.30	7.11	
S0609512-065	WRD-21	8-18	59.0	11.0	30.0	Sandy Clay Loam	47.0		0.75	0.87	
S0609512-066	WRD-21	18-36	68.0	18.0	14.0	Sandy Loam	18.2		0.26	2.48	
S0609512-067	WRD-21	36-50	67.0	25.0	8.0	Sandy Loam	14.2		0.35	0.79	
S0609512-068	WRD-21	50-62	69.0	23.0	8.0	Sandy Loam	14.8		0.46	2.66	
S0609512-069	WRD-21	62-96	68.0	20.0	12.0	Sandy Loam	23.7		0.17	1.07	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter·M[redacted]in Laboratories, Inc.

Soil A[redacted]sis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[redacted]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths	CO3	Alkalinity PE
		In.	%	meq/L
S0609512-062	WRD-19	51-68	19.7	3.45
S0609512-063	WRD-19	68-90	19.8	2.93
S0609512-064	WRD-21	0-8	21.2	3.76
S0609512-065	WRD-21	8-18	29.8	4.08
S0609512-066	WRD-21	18-36	20.3	2.72
S0609512-067	WRD-21	36-50	21.6	3.34
S0609512-068	WRD-21	50-62	16.8	2.51
S0609512-069	WRD-21	62-96	20.7	2.51

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

Inter·M[illegible]in Laboratories, Inc.

Soil An[illegible]sis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0[illegible]51001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Sodium meq/L	Potassium meq/L	SAR
S0610051-064	WRD-20	6-13	7.8	47.6	0.56	2.4	2.47	1.47	0.14	0.67	0.10
S0610051-065	WRD-20	13-28	8.1	24.1	0.27	0.6	1.22	0.63	0.13	0.32	0.14
S0610051-066	WRD-20	28-54	8.0	25.4	0.32	0.2	1.40	0.76	0.07	0.42	0.07
S0610051-067	WRD-20	54-72	8.1	38.5	0.27	1.1	1.18	0.87	0.24	0.21	0.23
S0610051-079	WRD-20	72-96	8.2	28.3	0.32	0.3	0.97	1.23	0.16	0.28	0.16
S0610051-068	WRD-22	0-6	7.7	36.6	0.40	1.8	2.16	0.88	0.08	0.35	0.07
S0610051-069	WRD-22	6-15	7.7	48.0	0.34	3.7	1.85	0.83	0.16	0.19	0.13
S0610051-070	WRD-22	15-28	8.0	34.9	0.29	1.2	1.64	0.80	0.13	0.18	0.11
S0610051-071	WRD-22	28-48	8.0	28.0	0.25	0.8	1.18	0.64	0.13	0.16	0.14
S0610051-072	WRD-22	48-60	8.0	30.1	0.27	1.0	1.34	0.67	0.10	0.16	0.10
S0610051-073	WRD-22	60-84	8.2	27.3	0.30	0.5	1.08	0.96	0.09	0.25	0.09
S0610051-074	WRD-23	0-6	7.7	48.4	0.60	4.9	3.20	1.35	0.07	0.53	0.05
S0610051-075	WRD-23	6-12	7.9	44.6	0.38	2.9	1.97	0.91	0.15	0.30	0.13
S0610051-076	WRD-23	12-22	7.9	41.0	0.35	1.8	1.76	0.92	0.14	0.16	0.12
S0610051-077	WRD-23	22-40	8.0	33.2	0.24	0.7	1.12	0.77	0.15	0.06	0.16
S0610051-078	WRD-23	40-62	8.2	38.6	0.23	0.6	1.01	0.94	0.24	0.06	0.24
S0610051-035	WRD-23	62-80	8.1	43.9	0.44	0.8	1.61	1.95	0.64	0.14	0.48

These results apply only to the samples tested.

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Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter-Mo[redacted]n Laboratories, Inc.

Soil A[redacted]s Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: SC[redacted]1001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0610051-064	WRD-20	6-13	41.0	29.0	30.0	Clay Loam	17.7		0.12	1.62	
S0610051-065	WRD-20	13-28	69.0	21.0	10.0	Sandy Loam	18.6		0.07	0.37	
S0610051-066	WRD-20	28-54	79.0	14.0	7.0	Loamy Sand	15.8		0.03	0.94	
S0610051-067	WRD-20	54-72	45.0	29.0	26.0	Loam	13.9		0.53	1.23	
S0610051-079	WRD-20	72-96	82.0	13.0	5.0	Loamy Sand	17.6		0.29	0.28	
S0610051-068	WRD-22	0-6	63.0	23.0	14.0	Sandy Loam	25.0		1.94	4.52	
S0610051-069	WRD-22	6-15	19.0	42.0	39.0	Silty Clay Loam	7.0		0.76	9.01	
S0610051-070	WRD-22	15-28	47.0	27.0	26.0	Sandy Clay Loam	5.6		0.80	0.31	
S0610051-071	WRD-22	28-48	65.0	21.0	14.0	Sandy Loam	13.7		0.29	0.13	
S0610051-072	WRD-22	48-60	65.0	21.0	14.0	Sandy Loam	14.5		0.35	0.07	
S0610051-073	WRD-22	60-84	74.0	18.0	8.0	Sandy Loam	21.8		0.57	0.28	
S0610051-074	WRD-23	0-6	31.0	38.0	31.0	Clay Loam	12.5		1.43	8.26	
S0610051-075	WRD-23	6-12	36.0	33.0	31.0	Clay Loam	14.7		0.31	1.74	
S0610051-076	WRD-23	12-22	38.0	34.0	28.0	Clay Loam	12.5		0.29	1.09	
S0610051-077	WRD-23	22-40	51.0	30.0	19.0	Loam	17.2		0.21	1.03	
S0610051-078	WRD-23	40-62	31.0	44.0	25.0	Loam	20.0		0.89	0.28	
S0610051-035	WRD-23	62-80	18.0	41.0	41.0	Silty Clay	14.0		0.35	1.65	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter·M[redacted]in Laboratories, Inc.

Soil A[redacted]s Report

Talon Resources, Inc.

PO Box 1230

Huntington, UT 84528

Report ID: S[redacted]1001

Date: 11/14/2006

Work Order: S0610051

Project: Talon Resources Soil

Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0610051-064	WRD-20	6-13	20.8	3.13
S0610051-065	WRD-20	13-28	25.4	2.30
S0610051-066	WRD-20	28-54	21.7	2.72
S0610051-067	WRD-20	54-72	24.3	2.51
S0610051-079	WRD-20	72-96	16.5	2.51
S0610051-068	WRD-22	0-6	20.2	3.13
S0610051-069	WRD-22	6-15	23.8	2.72
S0610051-070	WRD-22	15-28	18.9	2.72
S0610051-071	WRD-22	28-48	17.9	2.30
S0610051-072	WRD-22	48-60	17.5	2.30
S0610051-073	WRD-22	60-84	21.0	2.51
S0610051-074	WRD-23	0-6	21.4	4.60
S0610051-075	WRD-23	6-12	23.6	3.34
S0610051-076	WRD-23	12-22	25.6	3.24
S0610051-077	WRD-23	22-40	29.8	2.30
S0610051-078	WRD-23	40-62	35.3	1.99
S0610051-035	WRD-23	62-80	30.4	2.09

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07040226

Report Date: 04/24/07
Date Received: 04/05/07

Sample ID	Client Sample ID	Analysis	EC SatPst	Saturation SatPst	Lime as CaCO3	pH SatPst	NO3 Soluble	K Soluble	K SatPst	K NH4OAc	P, Olsen-NAHCO3	Ca SatPst	Mg SatPst	Na SatPst	SAR
		Units	mmhos/cm	%	%	s_u_	mg/kg-dry	mg/kg-dry	meq/L	meq/100g	mg/kg-dry	meq/L	meq/L	meq/L	unitless
		Depth	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
C07040226-001	SP-28	0-8	0.47	60.2	18.9	7.7	3.9	7.56	0.32	1.0	< 5	2.8	2.3	1.0	0.65
C07040226-002	SP-28	8-24	0.48	65.4	17.6	8.0	1.6	4.44	0.17	0.77	< 5	1.8	2.4	2.2	1.50
C07040226-003	SP-28	24-48	5.94	72.6	18.5	8.1	2.8	13.6	0.48	0.77	< 5	13	42	29	5.50
C07040226-004	SP-35	0-9	0.56	55.4	16.7	7.7	5.1	27.7	1.3	1.8	45	4.0	2.7	0.20	0.11
C07040226-005	SP-35	9-19	0.44	54.6	17.4	7.9	1.1	27.0	1.3	1.6	25	2.4	2.3	0.19	0.12
C07040226-006	SP-35	19-30	0.40	31.5	15.0	8.2	1.1	20.1	1.6	1.1	5	1.5	1.8	0.28	0.22
C07040226-007	SP-35	30-45	0.37	30.5	17.7	8.4	1.1	24.1	2.0	0.70	< 5	0.98	1.4	0.23	0.22
C07040226-008	SP-35	45-70	0.46	37.3	18.0	8.8	1.0	45.9	3.1	1.3	< 5	0.73	1.4	0.37	0.37
C07040226-009	SP-37	0-6	0.51	46.7	4.5	7.8	3.9	8.71	0.48	0.83	10	5.1	2.1	0.16	0.08
C07040226-010	SP-37	6-12	0.44	45.4	7.5	7.7	6.5	7.15	0.40	0.71	< 5	4.2	1.8	0.16	0.09
C07040226-011	SP-37	12-24	0.29	38.7	11.1	8.0	1.9	3.94	0.26	0.35	< 5	2.3	1.4	0.18	0.13
C07040226-012	SP-37	24-38	0.25	35.2	15.3	8.2	2.0	1.24	0.09	0.096	< 5	1.6	1.7	0.18	0.14
C07040226-013	SP-37	38-58	0.27	30.3	17.3	8.2	1.5	1.22	0.10	0.069	< 5	1.5	2.0	0.44	0.34
C07040226-014	SP-38	0-6	0.47	69.9	24.7	8.0	2.7	14.2	0.52	0.74	8	3.2	3.4	0.17	0.09
C07040226-015	SP-38	6-12	0.33	81.8	17.8	8.3	1.6	5.55	0.17	0.42	< 5	1.5	3.4	0.23	0.15
C07040226-016	SP-38	12-20	0.49	71.1	28.3	8.5	1.4	2.58	0.09	0.23	< 5	1.3	5.2	0.70	0.39
C07040226-017	SP-38	20-24	0.57	71.5	44.5	8.3	3.0	3.04	0.11	0.21	< 5	1.8	5.6	0.84	0.44
C07040226-018	SP-39	0-6	0.32	43.7	8.5	7.8	2.1	2.87	0.17	0.45	6	3.1	1.2	0.27	0.19
C07040226-019	SP-39	6-12	0.38	41.9	7.9	7.8	1.7	3.07	0.19	0.45	< 5	3.9	1.5	0.34	0.21
C07040226-020	SP-39	12-24	0.23	35.3	13.9	8.0	1.2	1.46	0.11	0.17	< 5	2.2	0.98	0.30	0.24
C07040226-021	SP-39	24-36	0.20	32.3	14.4	7.9	1.2	1.10	0.09	0.089	< 5	1.7	1.0	0.20	0.17
C07040226-022	SP-40	0-6	0.53	85.8	14.4	8.0	1.5	19.0	0.57	1.1	11	2.3	4.6	0.86	0.47
C07040226-023	SP-40	6-12	1.81	88.4	18.0	8.4	1.1	13.2	0.38	0.50	6	3.1	20	3.6	1.01
C07040226-024	SP-40	12-22	1.29	76.1	19.9	9.0	1.1	5.83	0.20	0.26	6	0.51	14	4.1	1.46
C07040226-025	SP-41	0-6	0.46	51.3	14.5	8.0	1.4	29.1	1.5	1.1	8	3.9	1.7	0.20	0.12
C07040226-026	SP-41	6-12	0.53	54.9	12.1	8.0	4.7	22.4	1.0	1.5	6	4.4	2.7	0.27	0.15
C07040226-027	SP-41	12-36	0.22	69.0	16.6	8.1	1.1	5.32	0.20	0.69	< 5	1.4	1.6	0.19	0.15
C07040226-028	SP-41	36-64	0.43	63.9	18.5	8.2	1.1	6.72	0.27	0.41	< 5	1.4	3.9	0.65	0.40
C07040226-029	SP-41	64-80	0.66	31.5	17.3	8.8	1.2	3.50	0.28	0.15	< 5	0.67	5.7	2.9	1.63
C07040226-030	SP-42	0-9	0.33	42.8	18.0	7.9	3.9	6.62	0.39	0.42	5	3.7	0.97	0.16	0.10
C07040226-031	SP-42	9-24	0.28	60.9	18.5	8.1	3.5	8.00	0.34	0.81	< 5	2.5	1.3	0.26	0.19
C07040226-032	SP-42	24-36	0.32	44.7	16.0	8.3	1.5	6.81	0.39	0.36	< 5	2.3	2.9	0.31	0.20
C07040226-033	SP-42	36-48	0.28	31.4	18.2	8.6	1.4	5.31	0.43	0.43	< 5	0.94	1.8	1.3	1.14

LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07040226

Report Date: 04/24/07
Date Received: 04/05/07

		Analysis	Organic Matter	Sand	Silt	Clay	Texture
		Units	%	%	%	%	
Sample ID	Client Sample ID	Depth	Results	Results	Results	Results	Results
C07040226-001	SP-28	0-8	2.5	7.0	38	55	C
C07040226-002	SP-28	8-24	1.4	9.0	34	57	C
C07040226-003	SP-28	24-48	1.0	4.0	36	60	C
C07040226-004	SP-35	0-9	4.3	12	44	44	SiC
C07040226-005	SP-35	9-19	1.8	16	40	44	SiC
C07040226-006	SP-35	19-30	1.2	51	27	22	SCL
C07040226-007	SP-35	30-45	0.75	59	27	14	SL
C07040226-008	SP-35	45-70	0.86	42	39	19	L
C07040226-009	SP-37	0-6	4.0	38	30	32	CL
C07040226-010	SP-37	6-12	2.9	48	23	29	SCL
C07040226-011	SP-37	12-24	3.0	56	24	20	SL - SCL
C07040226-012	SP-37	24-38	0.67	71	18	11	SL
C07040226-013	SP-37	38-58	0.45	73	18	9.0	SL
C07040226-014	SP-38	0-6	6.2	12	44	44	SiC
C07040226-015	SP-38	6-12	3.4	2.0	47	51	SiC
C07040226-016	SP-38	12-20	1.9	11	46	43	SiC
C07040226-017	SP-38	20-24	1.1	10	42	48	SiC
C07040226-018	SP-39	0-6	2.3	36	33	31	CL
C07040226-019	SP-39	6-12	2.4	38	30	32	CL
C07040226-020	SP-39	12-24	1.2	62	20	18	SL
C07040226-021	SP-39	24-36	0.50	75	15	10	SL
C07040226-022	SP-40	0-6	5.7	10	42	48	SiC
C07040226-023	SP-40	6-12	2.9	5.0	44	51	SiC
C07040226-024	SP-40	12-22	1.4	21	44	35	CL
C07040226-025	SP-41	0-6	3.3	46	26	28	SCL
C07040226-026	SP-41	6-12	3.4	25	34	41	C
C07040226-027	SP-41	12-36	1.7	6.0	44	50	SiC
C07040226-028	SP-41	36-64	0.96	12	52	36	SiCL
C07040226-029	SP-41	64-80	0.56	54	31	15	SL
C07040226-030	SP-42	0-9	2.4	50	30	20	L
C07040226-031	SP-42	9-24	2.6	8.0	49	43	SiC
C07040226-032	SP-42	24-36	1.7	52	27	21	SCL
C07040226-033	SP-42	36-48	0.92	44	34	22	L

LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07041141

Report Date: 05/13/07
Date Received: 04/24/07

		Analysis	EC SatPst	Saturation SatPst	Lime as CaCO3	pH SatPst	NO3 Soluble	K Soluble	K SatPst	K NH4OAc	P, Olsen-NAHCO3	Se SatPst	Ca SatPst	Mg SatPst	Na SatPst
		Units	mmhos/cm	%	%	s_u_	mg/kg-dry	mg/kg-dry	meq/L	meq/100g	mg/kg-dry	mg/L	meq/L	meq/L	meq/L
Sample ID	**Client Sample ID**	**Depth**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
C07041141-001	Alton 48	0-3	0.52	85.6	4.5	7.7	2.6	6.41	0.19	1.1	10	< 0.001	3.6	1.3	1.4
C07041141-002	Alton 48	3-12	0.57	95.4	7.2	8.0	1.1	2.39	0.06	0.79	8	< 0.001	1.2	0.55	4.4
C07041141-003	Alton 48	12-30	2.63	106	7.5	8.2	1.3	5.38	0.13	0.86	7	< 0.001	3.0	1.8	17
C07041141-004	Alton 48	30-48	4.65	81.0	5.2	8.1	< 1.0	7.36	0.23	0.94	7	< 0.001	6.5	4.1	29
C07041141-005	Alton 48	48-84	6.20	87.5	4.0	7.9	1.4	11.8	0.35	1.1	9	< 0.001	15	8.1	37

LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07041141

Report Date: 05/13/07
Date Received: 04/24/07

		Analysis	SAR	Very Fine Sand	Sand	Silt	Clay	Texture	Organic Matter
		Units	unitless	%	%	%	%		%
Sample ID	Client Sample ID	Depth	Results	Results	Results	Results	Results	Results	Results
C07041141-001	Alton 48	0-3	0.92	4.8	7.0	33	60	C	3.5
C07041141-002	Alton 48	3-12	4.68	5.3	6.0	30	64	C	1.9
C07041141-003	Alton 48	12-30	11.2	11	12	28	60	C	1.7
C07041141-004	Alton 48	30-48	12.7	9.5	10	28	62	C	1.6
C07041141-005	Alton 48	48-84	10.8	6.5	7.0	30	63	C	1.5

LABORATORY ANALYTICAL REPORT

Revised Date: 05/18/07
Report Date: 05/06/07
Date Received: 04/16/07

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow Project
Workorder: C07040695

	Analysis	EC SatPst	Saturation SatPst	Lime as CaCO3	pH SatPst	NO3 Soluble	K Soluble	K SatPst	K NH4OAc	P, Olsen-NAHCO3	Ca SatPst	Mg SatPst	Na SatPst	SAR
	Units	mmhos/cm	%	%	s_u_	mg/kg-dry	mg/kg-dry	meq/L	meq/100g	mg/kg-dry	meq/L	meq/L	meq/L	unitless
Sample ID / **Client Sample ID**	**Depth**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
C07040695-001 Alton 49	0-3	0.42	58.0	17.8	8.1	< 1.0	7.04	0.31	0.46	7	2.9	1.5	0.07	0.05
C07040695-002 Alton 49	3-10	0.34	55.5	17.7	8.4	< 1.0	7.32	0.34	0.39	8	2.0	1.5	0.08	0.06
C07040695-003 Alton 50	0-4	0.20	75.4	18.5	8.4	1.4	6.38	0.22	0.78	6	1.6	0.36	0.13	0.13
C07040695-004 Alton 50	4-11	0.27	66.2	18.7	8.1	1.4	6.08	0.24	0.81	8	1.9	0.53	0.32	0.29
C07040695-005 Alton 50	11-19	0.30	72.0	18.5	8.4	1.3	4.97	0.18	0.65	9	1.9	0.59	0.57	0.52

LABORATORY ANALYTICAL REPORT

Revised Date: 05/18/07
Report Date: 05/06/07
Date Received: 04/16/07

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow Project
Workorder: C07040695

	Analysis		Very Fine Sand	Sand	Silt	Clay	Texture	Organic Matter
	Units		%	%	%	%		%
Sample ID	**Client Sample ID**	**Depth**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
C07040695-001	Alton 49	0-3	23	26	42	32	CL	2.0
C07040695-002	Alton 49	3-10	27	33	44	23	L	2.3
C07040695-003	Alton 50	0-4	3.7	4.0	38	58	C	1.4
C07040695-004	Alton 50	4-11	4.4	5.0	35	60	C	1.3
C07040695-005	Alton 50	11-19	6.3	7.0	37	56	C	1.4

Table C-2. Summary of laboratory analysis of overburden samples for Coal Hollow core holes, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter (calculated)3	Organic Carbon	Erodibility Factor (K-Factor)[4]	$CaCO_3$
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%
CH-01-05, 3 ft	8.00	0.33	0.12	0	49	51	SiC	0	78.4	0.12	2.0	1.05	0.29	28.3
CH-01-05, 6 ft	8.20	0.34	0.33	0	49	51	SiC	0	82.9	0.12	1.5	0.77	0.30	30
CH-01-05, 9-10 ft	8.40	0.52	0.96	10	61	29	SiCL	3	52.2	0.18	0.8	0.4	0.46	35.3
CH-01-05, 12 ft	8.20	0.78	0.8	0	53	47	SiC	0	84.6	0.14	0.9	0.48	0.34	30.3
CH-01-05, 12-13 ft	8.30	0.73	0.7	44	39	17	L	11	35.9	0.13	0.6	0.3	0.38	25.5
CH-01-05, 16 ft	8.30	0.65	0.66	20	55	25	SiL	6	50.5	0.17	0.7	0.35	0.42	30.3
CH-01-05, 30 ft	8.00	3.13	0.79	8	47	45	SiC	0	81.9	0.14	0.9	0.45	0.32	26.1
CH-03-05, 0-3 ft	7.80	0.42	0.05	70	21	9	SL	11	25.7	0.08	1.2	0.62	0.24	15.6
CH-03-05, 3-6 ft	8.30	0.27	0.09	77	17	6	LS	9	21.8	0.07	0.4	0.23	0.22	27.7
CH-03-05, 9 ft	8.40	0.25	0.11	82	13	5	LS	7	20.4	0.06	0.3	0.15	0.17	46.2
CH-03-05, 16 ft	8.40	0.4	0.31	80	14	6	LS	5	20.2	0.06	0.2	0.11	0.17	64.7
CH-05-05, 0-1 ft	7.90	0.43	0.1	30	41	29	CL	3	44.5	0.15	1.7	0.91	0.30	22.7
CH-05-05, 3 ft	8.20	0.43	0.19	64	23	13	SL	12	27	0.09	0.7	0.39	0.26	24.9
CH-05-05, 9-10 ft	8.40	0.43	0.26	78	17	5	LS	4	20.8	0.06	0.2	0.13	0.18	60
CH-05-05, 14 ft	8.30	0.54	1.04	0	39	61	C	0	97.3	0.26	1.0	0.5	0.24	19.1
CH-05-05, 19 ft	8.10	1.04	3.57	2	37	61	C	0	97.6	0.25	0.8	0.44	0.23	18.2
Maximum	8.40	3.13	3.57	82.00	61.00	61.00		12	97.60	0.26	2.0	1.05	0.46	64.70
Minimum	7.80	0.25	0.05	0.00	13.00	5.00		0	20.20	0.06	0.2	0.11	0.17	15.60
Average	8.20	0.67	0.63	35.31	35.94	28.75	CL	4	52.61	0.13	0.9	0.46	0.28	31.56

1. USDA soil textures: sand (S); loamy sand (LS); sandy loam (SL); loam (L); clay loam (CL); sandy clay loam (SCL); silty clay loam (SiCL); silty clay (SiC); clay (C
2. Available water capacity calculated using using *Soil Water Characteristics Model* (Saxton et al., 1986).
3. Organic matter calculated from percent organic carbon.
4. Erodibility factor (K) calculated from lab and field data

Suitability Rating (Table 4. Utah DOGM, 2005): Good | Fair | Poor | Unacceptable

Undable to calculate because referenced calcualtion in Table 7, Footnote # 3 above is invalid for soils with percent silt + fine sand greater than 70 percent.

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project:
Workorder: B07041015

Report Date: 04/27/07
Date Received: 04/12/07

	Analysis	Sand	Silt	Clay	Very Fine Sand	Texture	pH, Sat Paste	Cond_ Paste	Saturation	Ca, Sat Paste	Mg, Sat Paste	K, Sat Paste	Na, Sat Paste	SAR
	Units	%	%	%	wt%		s_u_	mmhos/cm	%	meq/L	meq/L	meq/L	meq/L	unitless
Sample ID	Client Sample ID	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
B07041015-001	CH-01-05, 3 Feet	< 1	49	51	0	SiC	8.00	0.33	78.4	1.42	1.63	0.37	0.14	0.12
B07041015-002	CH-01-05, 6 Feet	< 1	49	51	0	SiC	8.20	0.34	82.9	0.69	2.19	0.35	0.40	0.33
B07041015-003	CH-01-05, 9-10 Feet	10	61	29	3	SiCL	8.40	0.52	52.2	0.57	3.40	0.28	1.36	0.96
B07041015-004	CH-01-5, 12 Feet	< 1	53	47	0	SiC	8.20	0.78	84.6	1.48	5.36	0.31	1.49	0.80
B07041015-005	CH-01-05, 12-13 Feet	44	39	17	11	L	8.30	0.73	35.9	1.71	4.69	0.26	1.25	0.70
B07041015-006	CH-01-05, 16 Feet	20	55	25	6	SiL	8.30	0.65	50.5	1.58	4.05	0.27	1.11	0.66
B07041015-007	CH-01-05, 30 Feet	8	47	45	0	SiC	8.00	3.13	81.9	16.9	25.8	1.11	3.65	0.79
B07041015-008	CH-03-05, 0-3 Feet	70	21	9	11	SL	7.80	0.42	25.7	2.98	1.26	0.30	0.07	0.05
B07041015-009	CH-03-05, 3-6 Feet	77	17	6	9	LS	8.30	0.27	21.8	1.73	0.87	0.12	0.10	0.09
B07041015-010	CH-03-05, 9 Feet	82	13	5	7	LS	8.40	0.25	20.4	1.10	1.32	0.09	0.13	0.11
B07041015-011	CH-03-05, 16 Feet	80	14	6	5	LS	8.40	0.40	20.2	1.22	2.24	0.16	0.40	0.31
B07041015-012	CH-05-05, 0-1 Feet	30	41	29	3	CL	7.90	0.43	44.5	2.22	2.21	0.19	0.15	0.10
B07041015-013	CH-05-05, 3 Feet	64	23	13	12	SL	8.20	0.43	27.0	1.28	3.02	0.15	0.28	0.19
B07041015-014	CH-05-05, 9-10 Feet	78	17	5	4	LS	8.40	0.43	20.8	1.05	3.01	0.15	0.36	0.26
B07041015-015	CH-05-05, 14 Feet	< 1	39	61	0	C	8.30	0.54	97.3	1.50	2.69	0.21	1.51	1.04
B07041015-016	CH-05-05, 19 Feet	2	37	61	0	C	8.10	1.04	97.6	2.67	2.71	0.27	5.85	3.57
B07041015-017	CH-06-05, Soil	2	45	53	0	SiC	8.00	0.54	79.5	1.33	1.51	0.08	3.17	2.66
B07041015-018	CH-06-05, 5-10 Feet	20	39	41	6	C	8.50	ISS	ISS	ISS	ISS	ISS	ISS	ISS
B07041015-019	CH-06-05, 10 Feet	12	41	47	9	SiC	8.20	7.95	90.9	22.7	52.2	0.93	60.8	9.93
B07041015-020	CH-06-05, 20 Feet	10	31	59	6	C	8.00	7.18	143	26.7	23.3	1.07	61.7	12.3
B07041015-021	CH-06-05, 35-40 Feet	7	26	67	4	C	8.20	6.33	275	19.5	9.3	0.88	60.0	15.8
B07041015-022	CH-06-05, 42-49 Feet	6	44	50	5	SiC	8.30	6.47	192	12.3	7.0	1.07	66.4	21.4
B07041015-023	CH-01-05, 50 Feet, Dark Grey Clay	1	34	65	0	C	8.60	2.78	234	1.73	1.03	0.43	26.0	22.2

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project:
Workorder: B07041015

Report Date: 04/27/07
Date Received: 04/12/07

Sample ID	Client Sample ID	Neut Potential	Acid Potential	Acid/Base Potential	Lime	Organic Carbon	Nitrate as N	B-H2O Extr	As-Total	Ba-Total	Cd-Total	Cr-Total	Cu-Total	Fe-Total
	Units	t/kt	t/kt	t/kt	%	wt%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
B07041015-001	CH-01-05, 3 Feet	280	1.1	280	28.3	1.05	< 1	0.4	9	99	< 1	24	17	17300
B07041015-002	CH-01-05, 6 Feet	300	0	300	30.0	0.77	< 1	0.4	6	91	< 1	20	16	16100
B07041015-003	CH-01-05, 9-10 Feet	350	0	350	35.3	0.40	< 1	0.3	6	104	< 1	16	11	12800
B07041015-004	CH-01-5, 12 Feet	300	0	300	30.3	0.48	< 1	0.2	< 5	87	< 1	18	14	14400
B07041015-005	CH-01-05, 12-13 Feet	260	0	250	25.5	0.30	< 1	< 0.1	< 5	124	< 1	11	8	9780
B07041015-006	CH-01-05, 16 Feet	300	0	300	30.3	0.35	< 1	0.1	5	89	< 1	13	10	11300
B07041015-007	CH-01-05, 30 Feet	260	0	260	26.1	0.45	1	0.4	6	99	< 1	19	14	14100
B07041015-008	CH-03-05, 0-3 Feet	160	0	160	15.6	0.62	2	< 0.1	< 5	56	< 1	7	6	8620
B07041015-009	CH-03-05, 3-6 Feet	280	0	280	27.7	0.23	< 1	< 0.1	< 5	96	< 1	7	< 5	7000
B07041015-010	CH-03-05, 9 Feet	460	0	460	46.2	0.15	< 1	< 0.1	8	202	< 1	8	< 5	8100
B07041015-011	CH-03-05, 16 Feet	650	0	650	64.7	0.11	< 1	< 0.1	< 5	234	< 1	7	< 5	11400
B07041015-012	CH-05-05, 0-1 Feet	230	0	230	22.7	0.91	3	0.2	7	67	< 1	17	13	13500
B07041015-013	CH-05-05, 3 Feet	250	0	250	24.9	0.39	1	< 0.1	< 5	61	< 1	8	6	8120
B07041015-014	CH-05-05, 9-10 Feet	600	0	600	60.0	0.13	< 1	< 0.1	< 5	107	< 1	7	< 5	8140
B07041015-015	CH-05-05, 14 Feet	190	0	190	19.1	0.50	< 1	0.2	< 5	106	< 1	14	13	14500
B07041015-016	CH-05-05, 19 Feet	180	0	180	18.2	0.44	< 1	0.4	< 5	85	< 1	15	14	14600
B07041015-017	CH-06-05, Soil	21	0	20	2.1	0.73	6	0.2	< 5	65	< 1	18	14	13800
B07041015-018	CH-06-05, 5-10 Feet	130	0	130	12.6	0.37	1	0.6	< 5	63	< 1	12	11	10000
B07041015-019	CH-06-05, 10 Feet	69	0	68	6.9	0.35	3	0.4	< 5	57	< 1	15	13	14200
B07041015-020	CH-06-05, 20 Feet	60	1.6	58	6.0	0.38	8	0.4	< 5	94	< 1	25	19	16600
B07041015-021	CH-06-05, 35-40 Feet	90	3.6	87	9.0	0.33	5	2.3	< 5	124	< 1	11	11	11500
B07041015-022	CH-06-05, 42-49 Feet	51	17	34	5.1	0.90	17	2.7	< 5	84	< 1	15	10	13500
B07041015-023	CH-01-05, 50 Feet, Dark Grey Clay	41	12	29	4.1	0.77	1	4.1	< 5	134	< 1	15	10	10600

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project:
Workorder: B07041015

Report Date: 04/27/07
Date Received: 04/12/07

Sample ID	Client Sample ID	Pb-Total	Mn-Total	Hg-Total	Mo-Total	Se-Total	Ag-Total	Zn-Total
	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Results	Results	Results	Results	Results	Results	Results
B07041015-001	CH-01-05, 3 Feet	13	272	< 1	< 5	< 5	< 5	63
B07041015-002	CH-01-05, 6 Feet	12	222	< 1	< 5	< 5	< 5	61
B07041015-003	CH-01-05, 9-10 Feet	11	225	< 1	< 5	< 5	< 5	43
B07041015-004	CH-01-5, 12 Feet	11	283	< 1	< 5	< 5	< 5	54
B07041015-005	CH-01-05, 12-13 Feet	9	191	< 1	< 5	< 5	< 5	33
B07041015-006	CH-01-05, 16 Feet	10	159	< 1	< 5	< 5	< 5	40
B07041015-007	CH-01-05, 30 Feet	11	202	< 1	< 5	< 5	< 5	49
B07041015-008	CH-03-05, 0-3 Feet	7	152	< 1	< 5	< 5	< 5	28
B07041015-009	CH-03-05, 3-6 Feet	5	141	< 1	< 5	< 5	< 5	19
B07041015-010	CH-03-05, 9 Feet	< 5	217	< 1	< 5	< 5	< 5	14
B07041015-011	CH-03-05, 16 Feet	< 5	276	< 1	< 5	< 5	< 5	23
B07041015-012	CH-05-05, 0-1 Feet	11	264	< 1	< 5	< 5	< 5	47
B07041015-013	CH-05-05, 3 Feet	7	152	< 1	< 5	< 5	< 5	25
B07041015-014	CH-05-05, 9-10 Feet	< 5	233	< 1	< 5	< 5	< 5	16
B07041015-015	CH-05-05, 14 Feet	11	87	< 1	< 5	< 5	< 5	50
B07041015-016	CH-05-05, 19 Feet	11	144	< 1	< 5	< 5	< 5	54
B07041015-017	CH-06-05, Soil	11	118	< 1	< 5	< 5	< 5	46
B07041015-018	CH-06-05, 5-10 Feet	10	114	< 1	< 5	< 5	< 5	35
B07041015-019	CH-06-05, 10 Feet	9	108	< 1	< 5	< 5	< 5	35
B07041015-020	CH-06-05, 20 Feet	11	121	< 1	< 5	< 5	< 5	45
B07041015-021	CH-06-05, 35-40 Feet	19	322	< 1	< 5	< 5	< 5	44
B07041015-022	CH-06-05, 42-49 Feet	12	148	< 1	< 5	< 5	< 5	39
B07041015-023	CH-01-05, 50 Feet, Dark Grey Clay	13	80	< 1	< 5	< 5	< 5	43

Table D-1. Topsoil and subsoil salvage depths for soil pits described in Coal Hollow year 1 disturbance area. Salvage depths are for material rated as either good or fair based on Utah DOGM Guidelines for Management of Topsoil and Overburden (2005).

Pedon	Map Unit	Topsoil Depth	Subsoil Depth	Clayey Subsoil	Limitations
		inches	inches	inches	
LOF-1	1	12	12	0	Poor at 24": alkaline pH; clayey textures. Poor SAR at 48". Fair carbonates.
LOF-2	2	12	0	36	Clayey below 12". Fair below 48": EC and SAR. Fair carbonates.
LOF-3	2	4	15	14	Mildly alkaline at 4 ". Clayey below 19". Fair carbonates.
LOF-4	2	5	0	26	Clayey topsoil. Fair below 31": EC and SAR. Fair carbonates.
RDV-5	4	10	15	0	Poor pH below 25" (too alkaline). Poor SAR below 48". Fair carbonates.
RDV-6	3	6	18	0	Poor pH below 24" (too alkaline). Clayey texture below 34". Fair carbonates.
RDV-7	4	6	0	18	Clayey texture below 6 ". Fair carbonates below 12". Fair SAR below 24".
1YR-8	4	14	8	0	Fair pH at 14-22, poor pH below 22" (too alkaline). Fair carbonates to 22", poor below.
1YR-9A	6	0	12	0	Poor pH in surface 12"; unacceptable pH below 12" (too alkaline, good SAR). Use surface as subsoil. Fair carbonates to 70". Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
1YR-9B	6	14	34	0	Fair pH below 14". Fair carbonates. Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
1YR-10	4	13	13	0	Poor carbonates below 26".
1YR-11	4	16	32	0	Fair pH at 16-48". Loamy sand below 32". Fair carbonates below 32".Poor pH (too alkaline) below 48". Sand below 72" should not be used as subsoil.
1YR-12	3	10	0	16	Clay loam texture in surface 10" is fair. Carbonates fair at 10". Clayey texture below 10" is poor.
SP-13	6	12	0	36	Poor pH (too alkaline) below 48". Fair pH to 48". Mix clayey subsoil in 12-24" horizon with underlying clay loam to improve subsoil texture and lower carbonates in 24-48", but use as
SP-14	6	6	7	0	Poor pH (too alkaline) and carbonates (greater than 30 percent) below 13". Fair pH in 6-13"
SP-15	6	8	12	0	Poor pH (too alkaline) and carbonates (greater than 30 percent) below 20". Fair pH and carbonates in 8-20" horizon. Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-16	4	8	10	0	Poor pH (too alkaline) and carbonates (greater than 30 percent) below 18". Fair pH and carbonates in surface 18". Potential wet soil moisture conditions below 35". Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
WRD-17	4	9	36	0	Poor carbonates below 45". Clayey texture below 60"
WRD-18A	7	7	41	0	Fair carbonates to 60". Fair soil texture (clay loam) in 30-45" horizon. Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.

1. Salvage depths are based on soil rated as either good or fair (Utah DOGM, 2005).
2. Clayey subsoil depth is based on all soil suitability parameters being good or fair, except soil texture (Utah DOGM, 2005).

Table D-1. Topsoil and subsoil salvage depths for soil pits described in Coal Hollow year 1 disturbance area. Salvage depths are for material rated as either good or fair based on Utah DOGM Guidelines for Management of Topsoil and Overburden (2005).

Pedon	Map Unit	Topsoil Depth	Subsoil Depth	Clayey Subsoil	Limitations
		inches	inches	inches	
WRD-18B	4	9	25	0	Poor pH (too alkaline) below 34". Fair pH (too alkaline) in 9 to 34" zone. Fair carbonates to 96".
WRD-19	4	12	56	0	Poor pH (too alkaline) below 68". Fair pH (too alkaline) in 12 to 68" zone. Fair carbonates to 90".
WRD-20	8	6	66	0	Poor saturation percent (too low) could be mitigated by mixing with overlying and underlying subsoil materials. Fair carbonates to 96". Loamy sands beow 72" not included in subsoil
WRD-21	8	8	28	0	Poor pH (too alkaline) below 36". Fair pH (too alkaline) in 18 to 36" horizon. Fair carbonates
WRD-22	8	6	78	0	Fair carbonates to 84". Fair texture in 6 to 15" horizon.
WRD-23	4	6	34	0	Poor carbonates (greater than 30 percent) below 40". Clayey with high carbonates below 62".
DAH-24	5	5	0	0	Clayey texture from surface to shale at 32". Surface texture is clayey, but soil nutrients will be good for reclamation use. Saturation percent is fair in surface 5" and poor (too high) below 5". Fair EC below 17".
DAH-25	5	5	0	0	Surface texture is clayey, but soil nutrients will be good for reclamation use. Saturation percent is fair to poor (too high) below 5". Poor carbonates (greater than 30 percent) below 5". Shale at 32".
SP-26*	1	8	12	0	Soil wetness and increased carbonates below 20". Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-27*	1	8	9	0	Clayey soil and carbonates below 17". Soil wetness could be a problem below 90". Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-28	11	8	0	16	Heavy clay texture from surface. Common carbonate masses below 24"
SP-29*	9	12	0	24	Heavy clay texture below 12". Carbonates increase below 36". Soil wetness could be a problem below 60". Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-30*	1	6	0	30	Surface texture is clayey, but soil nutrients will be good for reclamation use. Carbonate masses occur below 36".
SP-31*	3	7	45	0	Carbonates increase below 17", but probably fair to 52" where they increase substantially.
SP-32*	1	8	23	0	Clay and carbonates increase below 31".
SP-33*	1	10	0	14	Clay and carbonates increase below 24".

1. Salvage depths are based on soil rated as either good or fair (Utah DOGM, 2005).
2. Clayey subsoil depth is based on all soil suitability parameters being good or fair, except soil texture (Utah DOGM, 2005).

Table D-1. Topsoil and subsoil salvage depths for soil pits described in Coal Hollow year 1 disturbance area. Salvage depths are for material rated as either good or fair based on Utah DOGM Guidelines for Management of Topsoil and Overburden (2005).

Pedon	Map Unit	Topsoil Depth	Subsoil Depth	Clayey Subsoil	Limitations
		inches	inches	inches	
SP-34*	4	9	36	0	Carbonates increase below 45".
SP-35	4	6	39	0	Surface is silty clay to 19". Salvage surface 6" as topsoil and then salvage remaining silty clay to 19" with loam subsoil Mixing should improve material. Poor pH below 45".
SP-36*	4	9	32	0	Carbonates increase substantially below 41".
SP-37	4	12	26	0	Available water capacity is fair below 24", but texture is in good range to 58".
SP-38	7	6	0	6	Soil is silty clay from surface down. Soil wetness is a potential problem below 12" during wet periods of the year. Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-39	4	12	24	0	Soil is very cobbly loamy sand below 35".
SP-40	7	6	0	6	Clay and poor saturation percentage to 12", but other parameters are good or fair. Poor pH below 12" Soil ground water at 23" at time of observations. Soil wetness could be a problem below 6". Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-41	9	6	0	58	Poor pH below 64". Fair saturation percent and carbonates from 12 to 64". Silty clay loam soil included with clayey salvage depth to simplyfy salvage operations.
SP-42	9	9	27	0	Poor pH below 36".Mixing of silty clay in 9 to 24" horizon with underlying sandy clay loam could mitigate soil texture limitation.
SP-43*	7	7	23	0	Carbonates increase below 17" and become unsuitable below 54". Field pH is poor below 30". Mixing of clay in 7 to 17" horizon with underlying clay loam could mitigate soil texture limitation. Soil wetness could be a problem from the surface down (water filling pit at 30" at time of observation). Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-44*	7	7	7	0	Carbonates increase below 14" and become unsuitable below 54". Field pH approaches poor below 14". Soil color indicates poor quality material below 14". Soil wetness could be a problem from the surface down (water filling pit at 14" at time of observation). Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-45*	7	12	23	0	Unsuitable carbonates at 35". Soil wetness could be a problem from the surface down (water filling pit at 66" at time of observation with wter perching on the underlying clay). Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.

1. Salvage depths are based on soil rated as either good or fair (Utah DOGM, 2005).
2. Clayey subsoil depth is based on all soil suitability parameters being good or fair, except soil texture (Utah DOGM, 2005).

Table D-1. Topsoil and subsoil salvage depths for soil pits described in Coal Hollow year 1 disturbance area. Salvage depths are for material rated as either good or fair based on Utah DOGM Guidelines for Management of Topsoil and Overburden (2005).

Pedon	Map Unit	Topsoil Depth	Subsoil Depth	Clayey Subsoil	Limitations
		inches	inches	inches	
SP-46*	7	12	32	0	Unsuitable carbonates below 44". Soil wetness could be a problem below 24" (water filling pit at44" at time of observation with severe caving of pit sidewalls). Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-47*	8	11	21	0	Carbonate accumulations below 32". Soil wetness could be a problem below 32" . Salvage topsoil and subsoil during portion of the year when soil is dry to avoid wet soil conditions.
SP-48*	1	6	0	24	Very heavy clay below 3" (difficult to dig with backhoe for observation pit. Clayey subsoil estimate based on observation of roots to 30". Observed mottles below 30" may be the result of surface moisture perching on the heavy clay below.
SP-49*	5	10	0	0	Interbedded shale and sandstone at 10". Soil is gravelly sandy clay loam and gravelly clay loam.
SP-50*	10	6	13	0	Shale at 19". Soil is clay loam texture.

1. Salvage depths are based on soil rated as either good or fair (Utah DOGM, 2005).
2. Clayey subsoil depth is based on all soil suitability parameters being good or fair, except soil texture (Utah DOGM, 2005).

Profile 1. fine, mixed, superactive, mesic Aridic Calciustept, photo not available.

Profile 2. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 3. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 4. fine, mixed, superactive, mesic Aridic Haplustepts.

Profile 5. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 5 Area. Surrounding area.

Profile 6. fine-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 6 Area. Surrounding area.

Profile 7. fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 9A. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 8. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 9B. coarse-loamy, mixed, superactive, frigid Typic Calciaquoll.

Profile 10. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 12. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 11. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 13. fine-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 14. fine-loamy, mixed, superactive, frigid Aquic Calciustept.

Profile 16. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 15. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 17. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 18A. fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

Profile 19. fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 18B. fine-loamy, mixed, superactive, frigid Aridic Calciustoll.

Profile 20. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

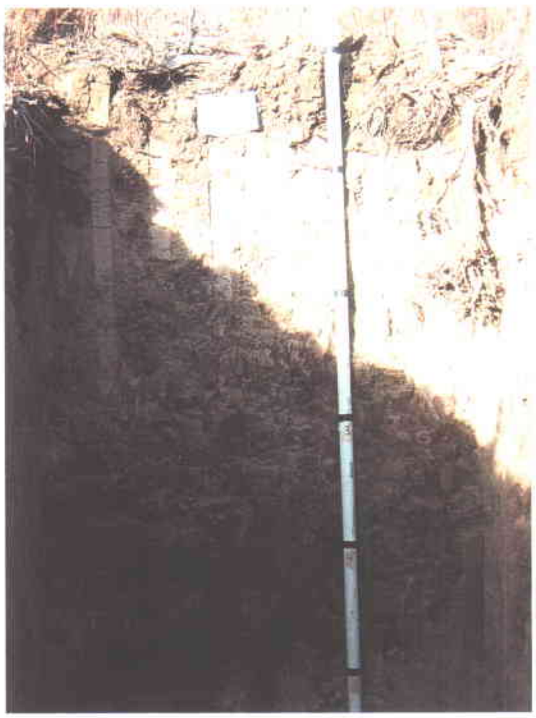
Profile 21. coarse-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 23. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 22 fine-loamy, mixed, superactive, mesic Calcidic Haplustalf.

Profile 24. fine, mixed, superactive, mesic Aridic Haplustepts.

Profile 25. fine, mixed, superactive, mesic Aridic Calciustept.



Profile 26. fine, mixed, superactive, frigid Aquic Calciustoll.

Profile 27 fine, mixed, superactive, mesic Aridic Calciustept, photo not available.

Profile 28. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 29. fine, mixed, superactive, mesic Aridic Calciustoll, photo not available.

Profile 30. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 31 fine-loamy, mixed, superactive, mesic Calcidic Argiustoll, photo not available.

Profile 32 fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 33. fine, mixed, superactive, mesic Aridic Calciustoll, photo not available.

Profile 34. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 34 Area. Surrounding area.

Profile 35. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 36. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 35 Area. Surrounding area.

Profile 36 Area. Surrounding area.

Profile 37. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profiles 38. fine, mixed, superactive, frigid Aeric Epiaquept.

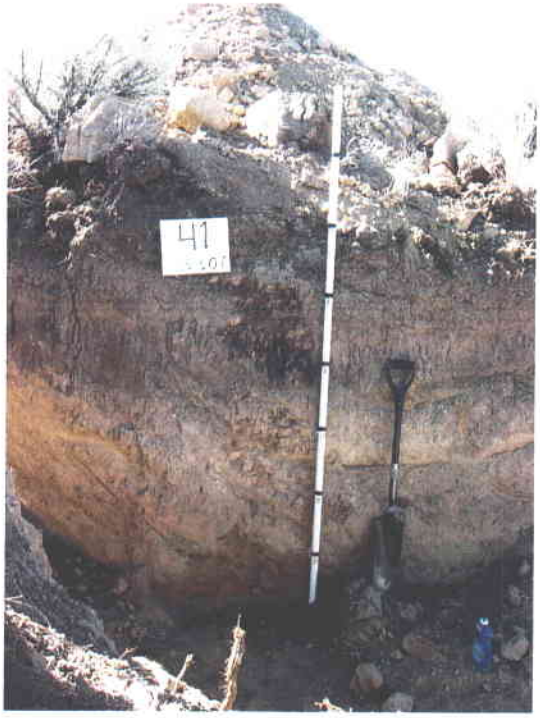
Profile 37 Area. Surrounding area.

Profile 38 Area. Surrounding area.

Profile 39. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 40. fine-loamy, mixed, superactive, frigid Aeric Calciaquoll.

Profile 39 Area. Surrounding area.



Profile 41. fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 42. fine-loamy, mixed, superactive, mesic Aridic Haplustoll.

Profile 41 Area. Surrounding area.

Profile 42 area. Surrounding area.

Profile 43. fine, mixed, superactive, frigid Typic Argiaquoll, photo not available.

Profile 44. fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 46. fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

Profile 45. fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 47. fine-loamy, mixed, superactive, mesic Calcidic Hapustalf.

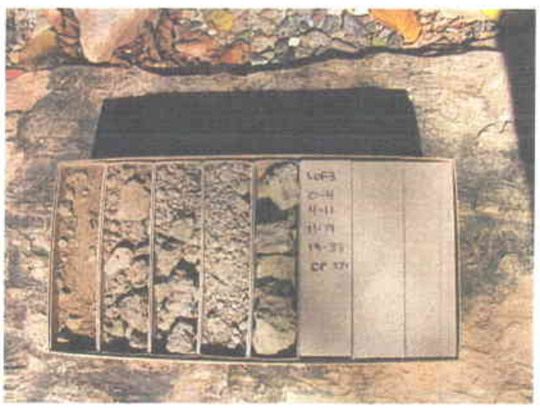
Profile 48. fine, mixed, superactive, mesic Aridic Haplustalf.

Profile 49 Area. loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent.

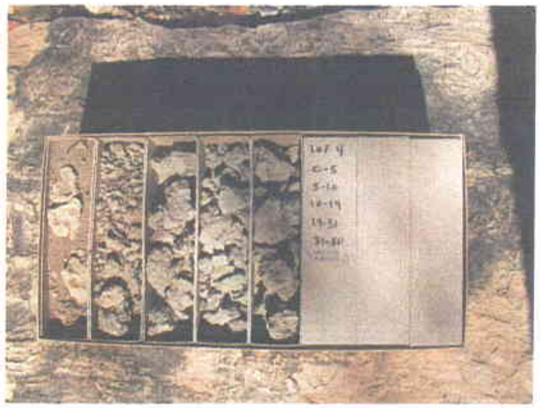
Profile 50. Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent.

Profile 1. fine, mixed, superactive, mesic Aridic Calciustept.

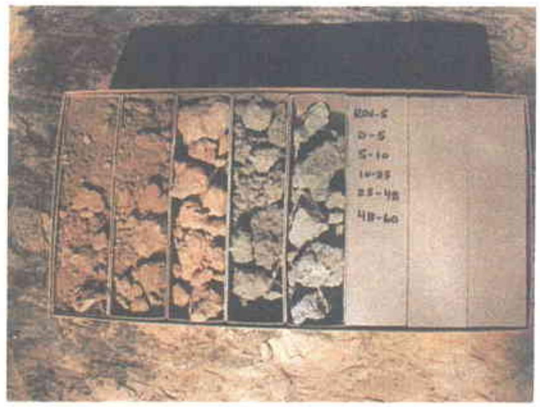
Profile 2. fine, mixed, superactive, mesic Aridic Calciustept.



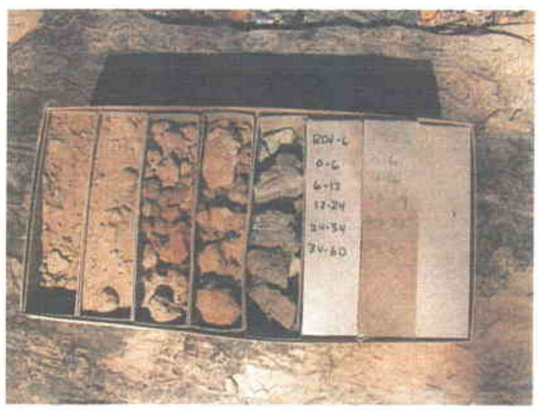
Profile 3. fine, mixed, superactive, mesic Aridic Calciustept.



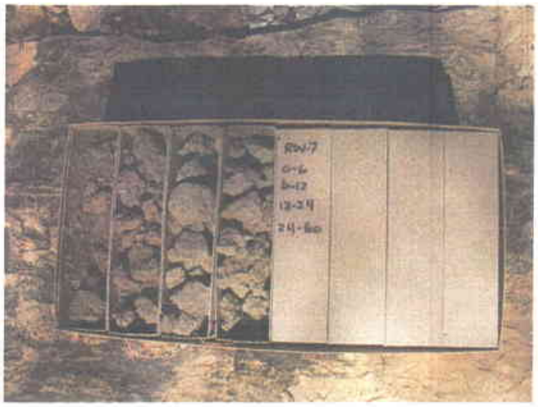
Profile 4. fine, mixed, superactive, mesic Aridic Haplustepts.



Profile 5. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 6. fine-loamy, mixed, superactive, mesic Aridic Calciustept.



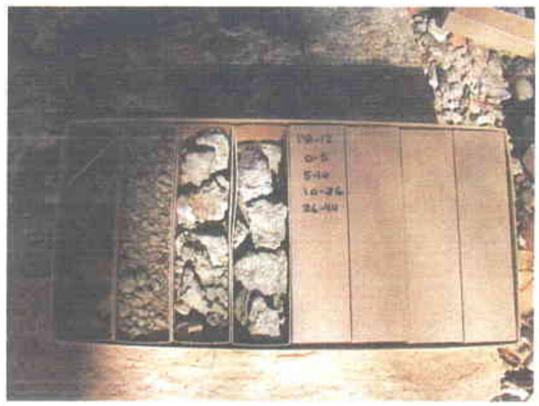
Profile 7. fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 10. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 8. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 11. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 9A. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 12. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 9B. Photo not available: coarse-loamy, mixed, superactive, frigid Typic Calciaquoll.

Profile 13. fine-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 16. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

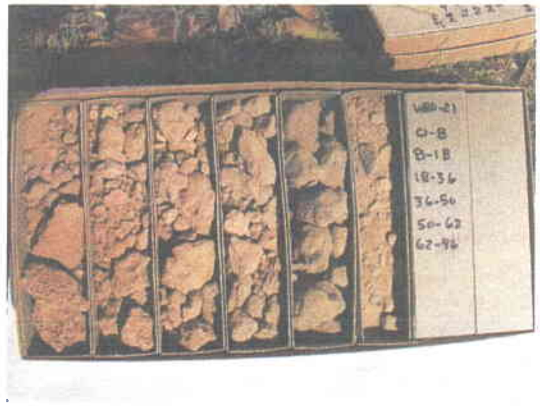
Profile 14. fine-loamy, mixed, superactive, frigid Aquic Calciustept.

Profile 17. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 15. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 18A. fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

Profile 18B. fine-loamy, mixed, superactive, frigid Typic Argiaquoll.



Profile 21. coarse-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 19. fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 22. fine-loamy, mixed, superactive, mesic Calcidic Haplustalf.

Profile 20. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 23. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 24. fine, mixed, superactive, mesic Aridic Haplustepts.

Profile 27. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 25. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 28. fine, mixed, superactive, mesic Aridic Calciustept.

Profile 26. fine, mixed, superactive, frigid Aquic Calciustoll.

Profile 29. fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 30. fine, mixed, superactive, mesic Aridic Calciustept.

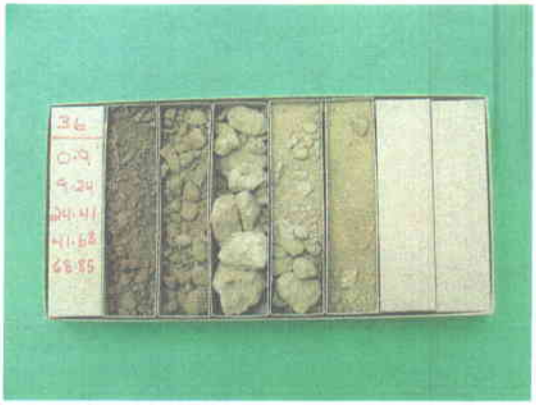
Profile 33. fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 31. fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

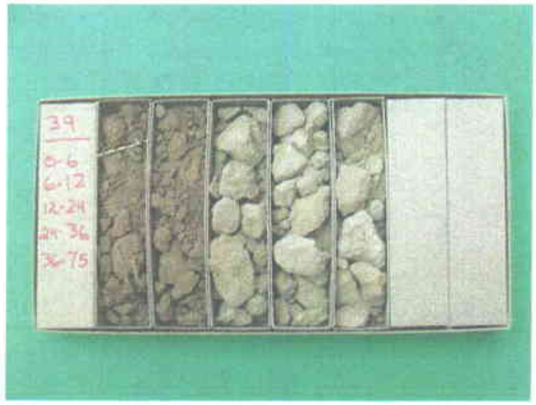
Profile 34. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 32. fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 35. fine-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 36. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

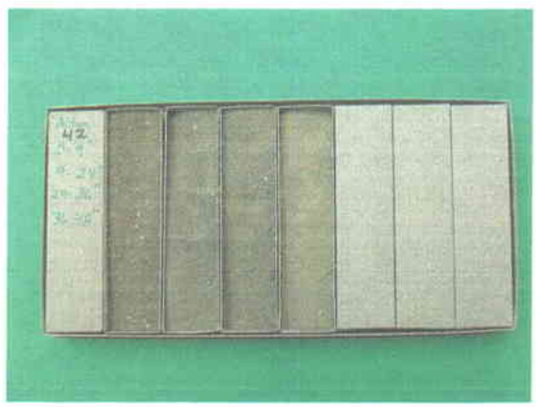


Profile 39. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 37. coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 41. fine, mixed, superactive, mesic Aridic Calciustoll.

Profiles 38 (Left) and 40 (Right). fine, mixed, superactive, frigid Aeric Epiaquept; (40) fine-loamy, mixed, superactive, frigid Aeric Calciaquoll.



Profile 42. fine-loamy, mixed, superactive, mesic Aridic Haplustoll.

Profile 43. fine, mixed, superactive, frigid Typic Argiaquoll.

Profile 46. fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

Profile 44. fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 47. fine-loamy, mixed, superactive, mesic Calcidic Hapustalf.

Profile 45. fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 48. fine, mixed, superactive, mesic Aridic Haplustalf.

Profile 49 (Left) and 50 (Right). loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent; and (50) Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent.

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